EMBOSSED LEATHER DESIGN

PENROSE'S PICTORIAL ANNUAL

Vol XIII
1907-8

The PROCESS YEAR BOOK
Edited by William Gamble

An Illustrated
Review of the
Graphic Arts

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THE INKS chiefly used in the printing of this book have been specially manufactured for us by **Messrs. A. B. Fleming & Co., Ltd.**, Caroline Park Works, Edinburgh, who have given special care and study to the exacting requirements of such a varied series of colour and monochrome subjects

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CARL ZEISS
JENA

Three Colour Print. Nicola Perscheid, Berlin

Taken from Nature with a ZEISS-Objective.

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The Editor regrets that it has been necessary to leave out several articles which arrived too late or were crowded out in making up the sheets

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*** *The Editor regrets that it has been necessary to leave out a number of half-tone blocks which arrived too late or were crowded out in making up the sheets.*

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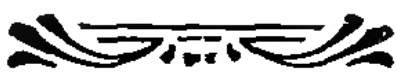


PHOTOGRAPHERS, ARTISTS AND PUBLISHERS.

*** *The Editor regrets that it was impossible to make use of all the photographs he received, but a number of those which are left over will be used in next year's volume. further photographs for which will be welcomed, and should be sent in by March 31st.*

THE YEAR'S PROGRESS IN PROCESS WORK.

By THE EDITOR.

LANDING AT PORT ERIN (Isle of Man)

Engraved by BRITISH PHOTO-ENGRAVING CO

Photograph by WM P. THOMSON

MANY people have a superstitious dislike to the number thirteen, and if we shared that feeling ourselves, we might have had some misgiving as to the success of this, the thirteenth, volume of our YEAR BOOK, but so far from there being any evidence of a falling-off which might mar the success of our publication, we are disposed to think that the book which we now place before our readers will be regarded as the best we have yet published.

We have emphasized on previous occasions the difficulty of presenting anything conspicuously new in process work when photo-mechanical processes have attained to such a wonderful pitch of excellence. All we can hope to do is to endeavour to put forth the old processes in a new dress or a new style, and with greater perfection in the execution of the plates or the printing.

The Aid of the Paper-maker and Ink-maker.

If we cannot hope to radically alter the processes, we can at any rate bring to our aid the resources of the paper-maker, the ink-maker and the printer, so as to present new effects and novel combinations of form and colour. In this respect we think we have some progress to show in the present volume. It has often been urged by critics of professed artistic taste that our work does not comply with the canons of good art, because it has been considered necessary for obtaining the best effects from half-tone and three-colour blocks to print them on highly-glazed paper in the most brilliant inks. However much we might desire to meet the wishes of such candid friends, we felt we were placed in a position of considerable difficulty, inasmuch as it is our duty to obtain for the photo-engraver the best possible printed result from the blocks he entrusts to us, his object being to present to the public the most perfect specimens of his craft. If we were to show the half-tones with greyed shadows, muddy half-tones and degraded high-lights, we should bring down upon ourselves a storm of denunciation from those who are our best supporters, and without whose aid this book could not be published, whilst our printers would probably have their work most undeservedly condemned.

Printing on Dull-Finished Paper.

For several years past we have attempted to find a paper of dull finish which would meet the requirements of half-tone printing, but after having a number of sheets run through the machine concurrently with the usual bright-finished

paper, we have reluctantly come to the conclusinn that it would be unwise to attempt so radical a change. This year, however, we besought the aid of the paper-maker and the ink-maker, asking the former to see if it were not possible to make a paper which should have a perfect surface without the gloss, and on the other hand, we begged the ink-maker to endeavour to adapt his inks to suit the altered character of the paper. After extended trials we decided to print the whole of the text and several of the sheets nf illustrations on dull-finished paper, and in order to give the printer a better chance we have had all the text illustrations made with a screen of 133 lines per inch instead of 150 lines We now present the result to our readers, trusting that if they cannot wholly approve the change they will at least give us credit for an honest attempt to overcome what some think is one of the greatest drawbacks of half-tone printing

The Failing of the Relief Block.

It is one reason why the relief block can never yield the depth and richness of the photogravure print from an intaglio plate that it is never possible to load up the half-tone with a sufficient amount of ink to give depth or relief. We have seen half-tones etched in intaglio which, when printed by the usual methods of copper-plate printing, yielded a result so unmistakably different in artistic quality that the non-technical observer could never be brought to believe that the relief and the intaglio plate were both made from the same negative. If it were not for the fact that the processes of intaglio printing were so relatively slow and expensive compared with letterpress printing there would be an immense demand for intaglio half-tone. So far, however, no method has been devised of satisfactorily and cheaply accomplishing the printing, although we have heard of several attempts which promise to be eventually successful. The Rembrandt process is, of course, an ideal attainment in this direction, but so long as it has to be printed from engraved copper rollers it must necessarily be expensive, and the heavy initial cost of producing the copper roller limits it to large editions.

Collotype Progress.

Collotype, of course, approaches most nearly to photogravure in quality when it is well executed, and we are pleased to note that the few firms who have survived the financial ordeal of making a commercial success of collotype printing have attained some remarkably fine results by modifications of the orthodox methods We present as a frontispiece to this volume, a plate printed by a special collotype method worked by the firm of L. Van Leer & Co., of Amsterdam, who are printing large editions of reproductions of the choicest masterpieces in the National Picture Galleries of Europe, and the results we have seen more nearly resemble carbon prints than anything that has hitherto come under our notice.

The Sinop process of collotype printing which has been hitherto regarded by the professional worker as rather an amateur method, has been applied in a commercial way on quite an extensive scale by one of the largest collotype printers on the Continent for reproductions in colour from famous paintings, and so successful has the process proved that the whole of the collotype machines run by this firm are regularly engaged in printing from plates prepared with the Sinop emulsion. A large firm in Italy is also working a process of collotype which is based on the conversion of an ordinary photographic negative into a collotype plate by means of a chemical process, and we have seen some very fine reproductions of paintings by this method, which seems to be perfectly practical.

Lithography seeking the Aid of Process Work.

Lithography for pictorial purposes is seeking the aid of photo-mechanical processes more and more and with the most successful results.

The Frey process, of which we give a specimen in this volume, is a good example of what can be accomplished by the combination of photographic methods with a reasonable amount of skilful hand retouching, and it has the advantage that there is no mechanical grain such as the half-tone screen to mar—as some think—the artistic quality of the result.

On the other hand, the Sears high-light process, of which we have given examples in previous issues, is making great progress in one of the largest lithographic firms in this country, and by applying it to a new type of rotary lithographic machine, which prints by set-off on to an india-rubber roller, it is found possible to obtain beautifully soft effects on even the roughest of papers, and to print at a high rate of speed.

Three and Four-colour Printing.

There has not been much change in the methods of printing three or four-colour work, which continues for the most part to be done on letterpress machines at a comparatively low rate of speed by the usual method of feeding through the sheet separately for each colour. The printing of the colours simultaneously, or rather that of printing them in quick succession, is always met with the difficulty of getting the first laid colours to dry, but this has been reasonably overcome on the Lambert machine, which prints four colours on four separate cylinders combined in one machine. This method is being worked successfully in this country by the Bemrose, Dalziel Co. and in France at the Imprimerie Crété at Corbeil, but it must be admitted that the machine is not so far applied to the highest class of work.

At the latter firm an ingenious process is worked for printing three or four-colour work on a two-colour machine, and we give some examples of work done by this method in this volume, together with an article dealing with the method.

The Metzograph Screen.

A notable advance has been made during the past year in the application of the Metzograph screen to colour work, and the example we present from the studios of the eminent firm of C. Angerer & Göschl is a good evidence of the capabilities of the screen, although perhaps it is somewhat discounted by the fact that one of the colours has been put in by means of the ordinary cross-line screen. This may not be so much the fault of the Metzograph screen as the fact that its manipulation for three-colour work has not yet been sufficiently practised, and no doubt with increased experience it will be possible to eventually utilize it without the aid of the half-tone screen. Certainly we have seen some excellent results in three colours produced entirely with the Metzograph screen, but as these were of an experimental nature it is hardly possible yet to speak with certainty on the possibilities of this screen, which, however, is being considerably used for making the under tint in two-colour work, and of which several examples are given in this volume. For monochrome work the Metzograph screen is making great progress, and when printed with a suitable ink on a dull-finished paper it yields an effect quite comparable to collotype or photogravure.

Improvement in Half-tone.

In ordinary half-tone work it will probably be noticed that there is at the present day an increased smoothness and softness of result being attained This

is partly due to a better realization of the optical conditions governin formation of tone and gradation through the more careful attention to the rel between the diaphragm and the screen distance. Several methods have suggested during the past year for securing more mathematical precision i respect, and Mr. Howard Farmer, of the Polytechnic School of Photogr has especially directed himself towards the development of a mechanical r of regulating the stop and screen distance in proportion to the focal exte and the ruling of the screen. For the other part, the improvement is pro due to the increasing use of etching machines instead of the old method of etching, as it has been demonstrated and pointed out in the article whic published on the Levy acid blast machine, that a considerable gain in the and quality of the work may be achieved by the adoption of the mecha method So far from being only a means of hastening the work for coarse paper printing, the etching machine has proved its value for enhancing the q of the finest screen work, not only on zinc, but also on copper It has contributed greatly to the improvement of line etching.

The Introduction of Etching Machines.

There can be no doubt that etching machines are to be the rule in pl engraving in the near future, and their widespread adoption is but another evic of the tendency to make process work more and more mechanical. The has gone by when the process could be worked as an artistic occupation, constant decrease in prices having made it necessary to carry on the pr on a large manufacturing scale if it is to be worked profitably. It may matter for regret that the artistic individuality is passing away from the c but it is no good contesting the inevitable, and the processes must fulfil the mo demands of cheapness and rapidity of execution. It would seem that the gr the facilities provided for doing the work the greater is the volume of forthcoming.

Degeneration of Line Work.

One matter for regret is that with the increased use of half-tone the etching process is being relegated to a backward place, and pen and ink ar find little encouragement to practise an art which up to the time of the half- boom had attained to a very high degree of perfection, and was practise many eminent artists. It may be, as we have already said, that the increa adoption of etching machines will lead to a revival of line etching. One re why it has fallen from its former position is that the photo-engraver has l reluctant to encourage it owing to the poorness of the prices paid for the w Some firms have abandoned their line etching department altogether, w others have only been able to maintain it by employing the cheapest lab so that as a natural result the work has deteriorated in quality.

The Intaglio Line.

Were it possible to print engraved plates—that is to say, plates engra in intaglio—with the same facility as relief blocks, line etching would be be done by that means than with relief plates, and it would lead to a great rev of line work, because no one would ever wish for anything better for pict representation in line than the metal engraver's incised line scratched or at one stroke, as it always possesses a freedom of richness which neither wood engraver nor the zinc etcher can ever excel. As one writer has remarl " there never was and there never will be a wood cut line having the powe

Photo by *Mr. H. W. Cave.*

COLOMBO BREAKWATER.

Andsleigh Process

André & Sleigh, Ltd.,
Bushey, Herts

"WILL NOT THE SMALL BOY BE PLEASED TO MEET HIS FATHER SO SOON?"

André & Sleigh, Ltd.

a deep line on a plate. For in block printing the line is only a blackened surface of paper, whereas in plate printing it is a *cast* with an additional thickness of printing ink." Even a pen drawing reproduced by photography and converted from negative to positive, so as to make an intaglio plate, yields a far superior result in the printing than any relief block. If, therefore, printers' engineers would provide the means for printing such plates with adequate speed a new and very acceptable style of line work could be created.

Colour Processes.

In colour work it cannot be said that there is any notable departure in the methods practised for the production of the blocks, except, perhaps, that the indirect process which involved the production first of continuous tone negatives, then a set of positives from these, and finally, a set of half-tone negatives from the latter—in all nine operations—has now been almost entirely abandoned and the work is done in one of two ways: either the colour record and half-tone negative is made direct at one operation on a dry plate bathed with suitable sensitizing dyes, or the same thing is done on plates coated with collodion emulsion. Each method has its advocates, but by far the larger proportion of commercial work is done with collodion emulsion. Invariably colour filters are used and are placed behind the lens, some workers using dry filters standardized for the work, such as Klein's colour filters, whilst others use liquid filters, which have to be made up by the operator. The practice of placing coloured filters in front of the plate has not made any progress, although an idea was patented about a year ago for incorporating the colour filter with the half-tone screen by sealing to the latter a glass plate coated with a coloured film of gelatine or collodion. The method has some drawbacks and disadvantages which probably outweigh the slight advantage that might be gained in rapidity of exposure and increased sharpness of definition.

Colour Negative Making without Filters.

During the past year a modification of the emulsion process has been made by which it is possible to dispense with colour filters entirely. To accomplish this the emulsion is so strongly dyed that the plate is sensitive to only the particular colour required, and it is claimed that not only is better rendering secured, but there is a considerable gain in the rapidity of exposure, and the amount of fine-etching required on the blocks is reduced to a minimum.

Illumination of Originals by Coloured Light.

It is probable that the next important improvement in colour work will be that of lighting the copy by means of an illuminant corresponding to the colour sensitiveness of the plate employed, and in that way filters may become unnecessary. It only needs that the manufacturer of arc lamp carbons should provide carbons impregnated with substances which will impart a suitable colour to the light. Such carbons are already available for the blue-violet light and the red light, but so far no commercial carbon has been introduced giving a suitable green light. The writer of this article some time ago invented an arc lamp which contains three sets of carbons in the one lamp, each set capable of being switched on separately, and as soon as the required carbons are at hand this lamp will find a very useful application. Mr. Howard Farmer has essayed to obtain the same result by placing colour filters in front of the arc lamp but we are afraid he will meet with difficulties due to the excessive heat of the lamp acting upon the colour filters.

Screen-plate Colour Photography.

The important advances which have been made in colour photography during the past year, by methods along the lines followed by Messrs. Lumière in their Autochrome plate, are calculated to have a great effect on the progress of three-colour printing The Autochrome plate may be used as a colour guide to the fine etcher and prover, and for this purpose the operator who has to copy paintings in picture galleries or who is sent out to reproduce views for colour work can take an Autochrome plate in addition to the usual set of three-colour negatives. The Omnicolour plate, which is fully described in this volume, by M. Du Hauron, achieves the same result in a different way.

The Warner-Powrie process, however, does more, for not only is it possible to produce the negative in colours similar to the Autochrome result, but it also permits of the possibility of making any number of transparent positives from this negative, and further, a trichromatic set of positives for reproduction by the three-colour process can be produced at any subsequent time in the studio from the original colour record negative. This is a feature of immense importance in three-colour process work, and as soon as the necessary plates are on the market we look forward to a great development arising from this process.

The Sister Arts of Electrotyping and Stereotyping.

In the printing of large editions from process blocks it has become essential for securing the rapidity of output necessary in periodical work to duplicate the plates, and fortunately the photo-engraver has been well aided in that requirement by the stereotyper and electrotyper, who have made great improvements in their methods in the course of the last year or two The Nickello process of stereotyping, for instance, has placed a great power in the hands of the printer by enabling him to get excellent fac-similes of the original blocks in a cheap and expeditious way, so that a number of duplicate formes can be placed on the machines, and long runs which would have worn out the original type and cuts can now be accomplished on flat-bed machines.

For very fine screen work the electro gives place to the stereo, and here again considerable advances have been made, not only in the more rapid, but also in the more perfect execution of the work.

Newspaper Illustrations.

It must strike even the most superficial observer very forcibly in perusing the daily newspapers that pictorial representation is greatly advancing, and that the pictures of current events which are now so often seen even in some of the most old-fashioned newspapers must be produced by some very rapid means, seeing that they are now often printed within a few hours of the occurrence of the event they portray. As a matter of fact, it has been demonstrated in the photo-engraving department of the *Daily Mirror* that it is possible to produce a zinc half-tone within twenty minutes of handing the photograph to the engraver, and it is quite an ordinary occurrence to produce plates in half an hour ready for the press No doubt in the near future coloured illustrations will make their appearance in a daily newspaper

"Stands England where she did?"

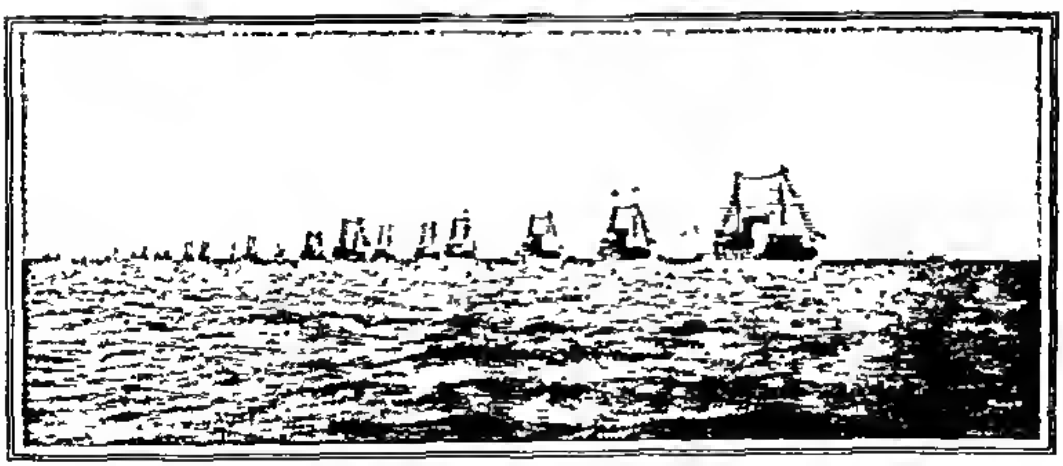
If we were asked to say whether England holds her position in photo-engraving we would assert most unhesitatingly that nowhere else in the world is a better

or more uniform artistic quality of work produced. For commercial illustrating we would concede the foremost position to the United States, where this class of work has been highly cultivated, because it bas been adequately rewarded by the lavish patronage of the great advertising firms.

To the Making of Illustrations there is no End.

We often see it remarked in the reviews of our ANNUAL that it would seem impossible to attain greater perfection, and yet each year the results we show answer this reflection by greater and greater triumphs. We believe ourselves there is no finality, and tbat photo-mechanical processes will leap from one stepping stone to another to yet higher attainments. The demand for finer accomplishments will create the supply, but if the photo-engraver is to give to the world his best he must not be harassed and hampered by peddling price-cutting. Given a fair return for his product he will be able to employ better men and better means for doing the work, thereby enabling a high standard to be maintained. At present he has been beaten down to the last farthing by many of his customers. It now needs some wealthy and liberal patrons to come forward to enable photo-processes to attain a higher standard of excellence.

We plead for a fairer treatment of a craft that has done so much to advance the pleasures of life and the progress of civilizing education by the enlivening and instructive influence of pictorial art.



FLEET SALUTING AT SPITHEAD

Block by
THE BRITISH PHOTO-ENGRAVING CO

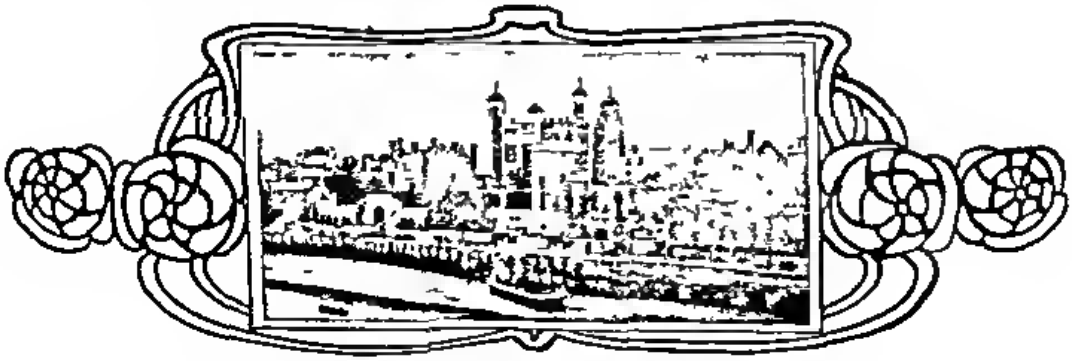
Photograph by
WEST & SONS

A NEW SCREEN.

By THE EDITOR.

Design and Block by
JOHN SWAIN & SON, LTD

WE present to our readers on the opposite page a distinct novelty in half-tone work. The portrait of Mr. Joseph Chamberlain has been produced by means of a new screen invented by Mr. A. Dargavel, the managing director of Messrs John Swain & Son, Ltd. This may be very well called the Wavy Line Screen, because it consists of waved instead of straight lines We think our readers will readily appreciate the advantage of the wave effect, especially in portraiture and landscape, the texture of the screen conforming sympathetically to the modelling of the object reproduced, thus following to some extent the method of the wood engraver. Mr. Dargavel informs us that he was led to the idea of such a screen by the fact that it always appeared to him incorrect to attempt to reproduce contour by means of a straight line screen, when there are few, if any, straight lines in nature. Where the screen is very fine, it is not perhaps a matter of much consequence if a straight line screen is used, as the screen effect is scarcely visible to the ordinary eye. The inventor therefore believes that the screen will be chiefly valuable for work of the coarser nature, such as newspaper illustrations, where the screen, if in straight lines or dots, becomes obvious and offensive to the eye—a grating effect in more senses than one. Details are fully retained with the wavy line screen, even where it is coarse, and a softness pervades the picture which must be pleasing to the artistic eye. In reproducing materials, such as textiles, furs, etc., the lines or dots cross and combine in such a way as to form a texture, which is quite unobtainable in the ordinary line screen. The specimen block we publish is produced by means of a home-made screen, the ruling of which is far from perfect. As soon as perfectly ruled screens can be obtained we anticipate results of a much improved quality. The idea is protected by a provisional patent.



THE TOWER OF LONDON

Block by
BOURNE & Co.

Photograph by
ALF J. THORNE

THE RIGHT HON. JOSEPH CHAMBERLAIN, M.P.

John Swain & Son, Ltd.

A PORTRAIT STUDY

Acme Tone Engraving Co., Ltd.

PHOTOGRAPH BY W. GILL.

A PICTORIAL PORTRAIT STUDY.

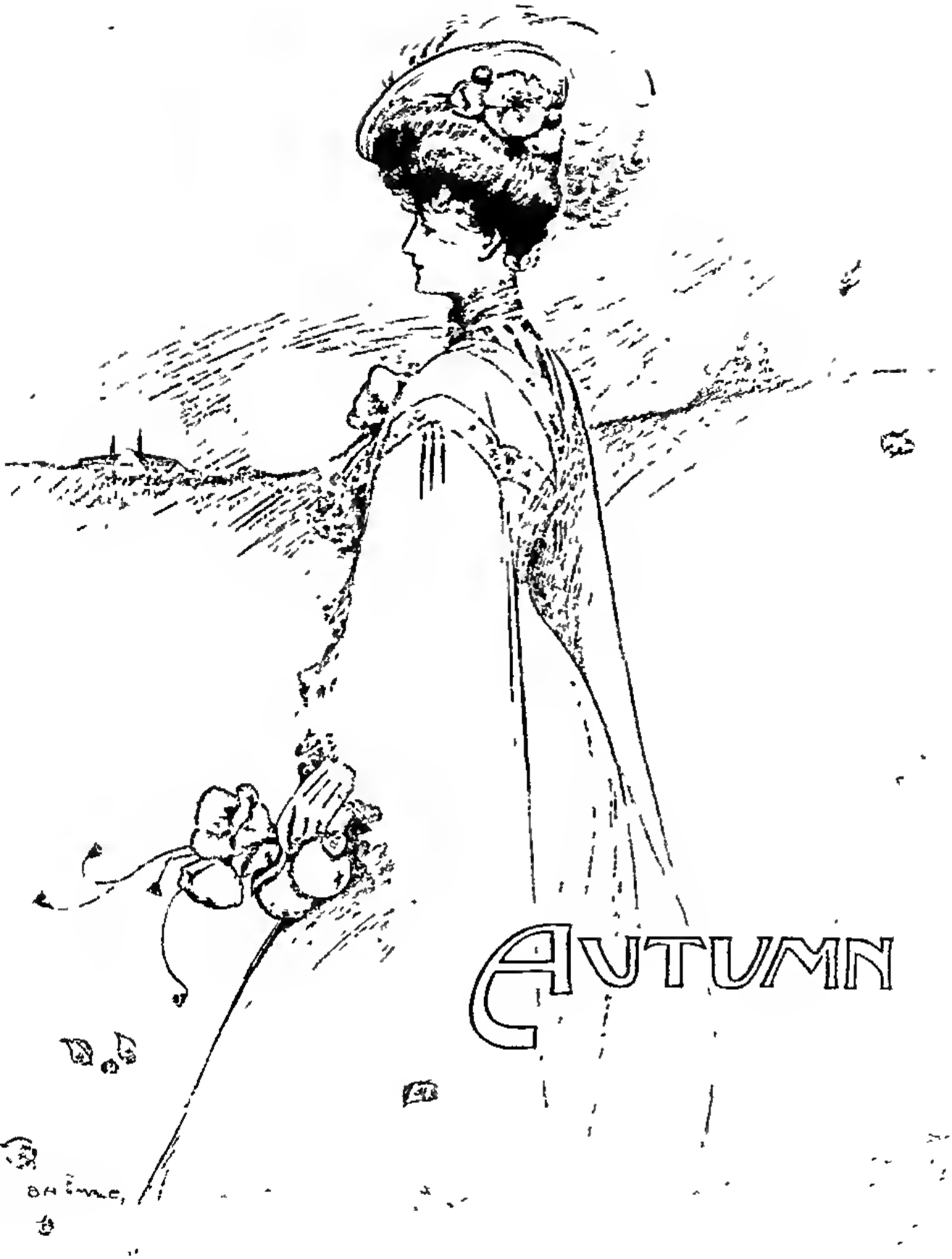
The Art Reproduction Co., Ltd.

LANDING.

Coarse Grain Block *Reprinted from "The Sunday Companion"*

Photo-Engraving Department of the
Amalgamated Press, Ltd.

HENRY VII CHAPEL, WESTMINSTER ABBEY.



TWO-COLOUR FASHION PLATE

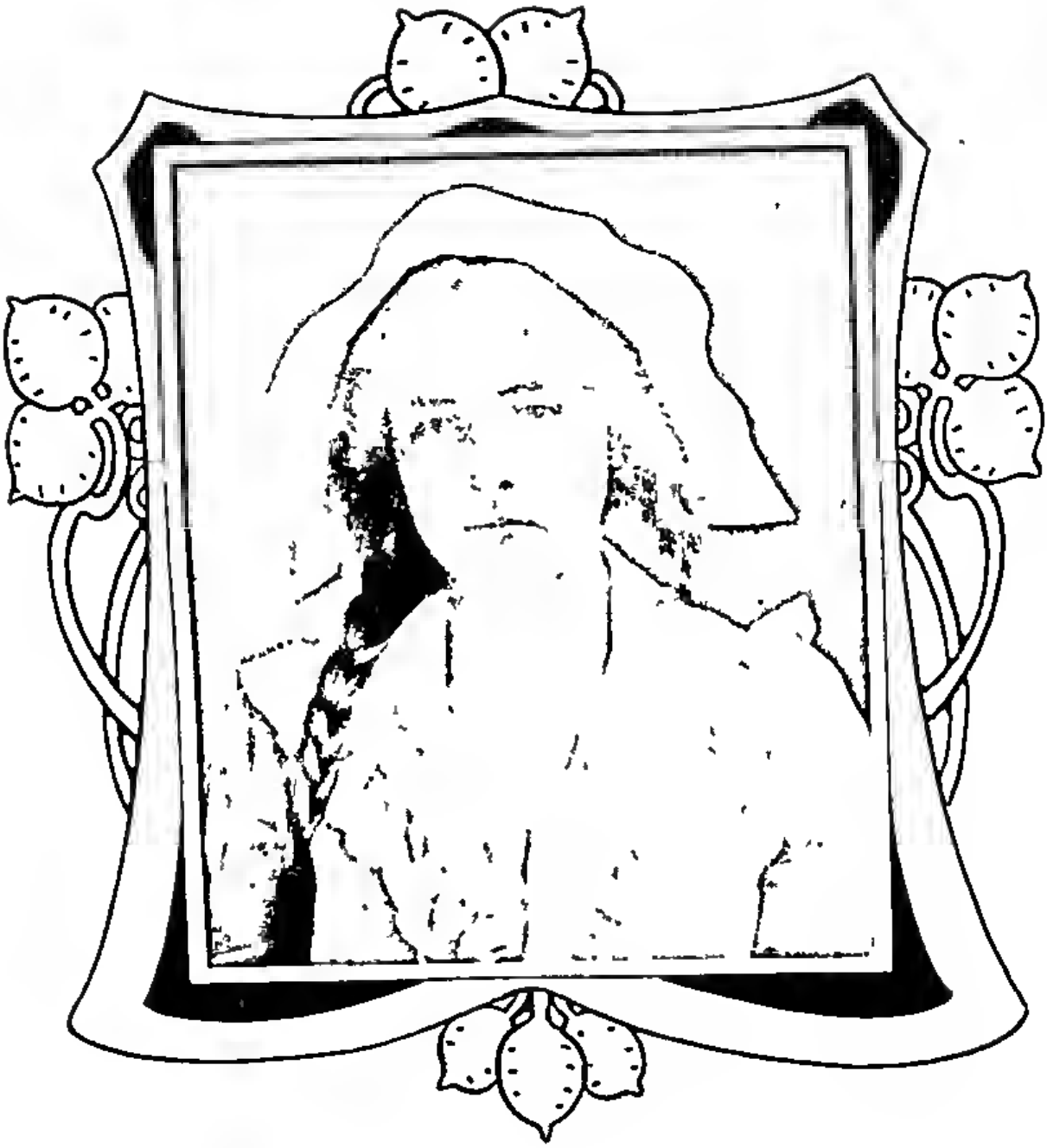
[illegible]
[illegible] & SON, LTD

Photographed direct from Nature

AMONG THE HOBGOBLINS.

(From a design by the Swedish artist J. Bauer.)

Wald. Zachrisson.



PHOTOGRAPH BY MR & MRS ALFRED BRACEWELL

MARGUERITE.

The Marshall Engraving Co.

ENGRAVING BY KUNLI FRERES

LISTENING TO THE WAVES.

Successors of E. Paez.

Samuel Pepys 1632 - 1703

OIL SKETC ON C

IN

Co

THE ORIGIN OF THE WARNER-POWRIE PROCESS AND APPLICATION OF THE FLORENCE PLATE TO PROCESS WORK.

By JOHN H. POWRIE.

OF the different fields to which the scientific mind may turn for intricate problems to solve, that of colour photography perhaps furnishes the greatest diversity of entanglements, as it requires some knowledge of chemistry, optics, electricity, mechanics and physical laws in general. So many minds possessed of ingenuity, technical skill and scientific attainments have contributed to the solution of this problem during the past forty years, that its practical attainment is necessarily the result of utilizing such suggestions and applications as have been demonstrated to be the most feasible and simple to carry out, and not the result of any individual inspiration or research. In other words, colour photography is the invention of many and the outgrowth of years of patient endeavour in different lines, to the accomplishment of the same end, the record of the image of nature in nature's colours.

The practical accomplishment of this task has been brought about by a thorough understanding of the mechanical difficulties involved, courageous financial support, the drudgery of scientific analysis, and experiment along commercial lines.

Mrs. Florence M. Warner

[illegible]

From the time that Clerk Maxwell, in 1861, first demonstrated the possibility of triple projection and colour reproduction by the use of filters and pigments, much serious work has been done to simplify what has come to be known as the three-colour process.

The first brilliant suggestion was made by Louis Ducos Du Hauron in 1867, when he suggested the screen and plate process of parallel juxtaposed bands of the three colours.

This is the basis of the present popular one-plate colour processes, first carried out by Dr. Joly and Mr. McDonough some fifteen years ago.

It was about this time that I first became interested in the subject whilst engaged in photo-engraving and lithography, in which work I also acquired some knowledge of the three-colour process. The practical experience obtained in this three-colour work and lithography in association with Miss Florence M. Warner was of inestimable value in the later experiments which have resulted at length in the "Florence" heliochromic plate. Equal credit is due to Miss Warner for the success achieved in overcoming the obstacles in our way, not alone as regards the financial support contributed by her, but also for her untiring

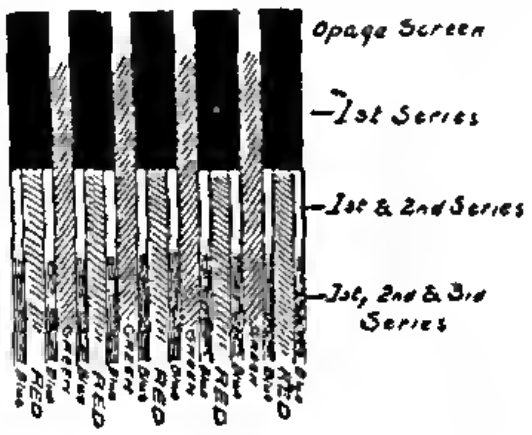


Fig. 1

zeal, her interest and practical suggestions in this line of research. Though I have given a brief description in a previous issue of this YEAR BOOK of the process, I will briefly explain that the screen plate consists of a sheet of glass upon one face of which successive coatings of bichromated fish glue and albumen are spread: the plate is then exposed under a screen similar to a single ruled half-tone screen, and developed like a copper plate. See Fig. 1.

It is afterwards plunged into a dye bath and, after rinsing, the colour is fixed in a tannin solution. A second series of lines (red) is then formed on the plate by again coating and exposing a second time after an adjustment in the printing frame that the lines do not overlap (as indicated in Fig. 1), again dyeing and fixing them. This series of operations is repeated a third time, but the use of the negative plate may be dispensed with for the blue, the plate being simply exposed to the light through the back. The red and green lines previously applied thus prevent the coating from being rendered insoluble except on the transparent portions between the lines; these spaces are dyed of a violet blue, and, though narrower, equal in total area those of red and green. We now have the three filters upon the plate in minute sub-divisions, so fine that they are not discernible as individual coloured lines, but mingle as light mixtures and assume

a general greyish or neutral tint. After receiving a protecting varnish, over which is spread a panchromatic gelatine emulsion, the plate may be exposed in the camera through the glass, and also through the coloured bands or lines, through which the light has to pass before reaching the sensitive surface. The image is developed either as a positive direct by reversal, or preferably in the ordinary manner as a negative, in which the original colour of the object as well as its lights and shades have been reversed.

To utilize the plate for securing a transparency in the original colour it is necessary to supply a similarly prepared plate carrying the colour lines on its surface, and on these, again, a suitable panchromatic transparency emulsion. A print is made from the negative by artificial light by contact, or the negative may be copied in the enlarging or reducing camera. To do this, however, it is well to explain that a number of obstacles to prevent the successful accomplishment of this task at once presented themselves. In 1900 the invention had been successfully carried out to the point of producing the polychrome screen, and the next year we secured plates coated with the emulsion upon which negatives and positives were obtained. The results, however, were far from satisfactory, owing to a multitude of technical difficulties which it is not my purpose to discuss

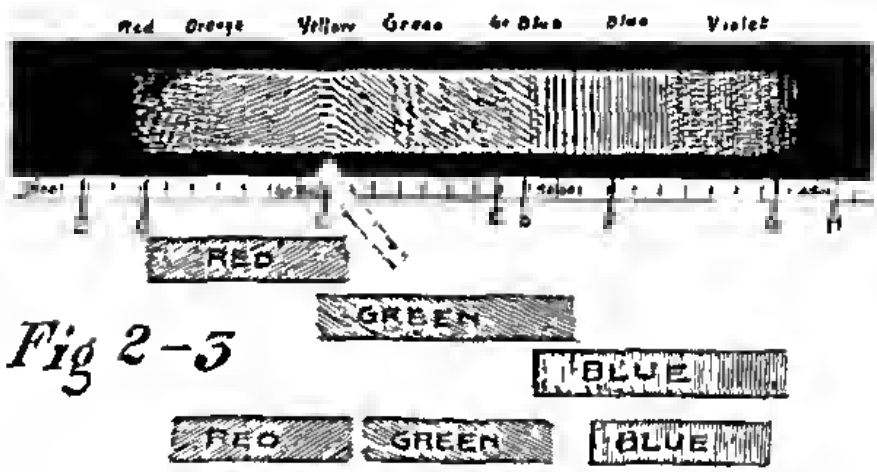


Fig 2–3

here; suffice it to say that within the past year the last of these obstacles has been satisfactorily overcome, and with the selection of the most suitable dyes for preparing the absorption filters, and of an emulsion peculiarly adapted to this class of work, together with perfected machinery for the commercial manufacture of the plates, it is expected they may soon be available for the amateur, professional and process worker.

To make clear to the reader how it is possible to make the transparencies from the complementary colour negative, I will explain that the colour bands upon the negative and positive plates are so arranged that they cross at right angles, that is to say, they are made parallel with the long side of a plate for those intended for the negatives and parallel with the short side for positive plates or transparencies.

The absorption bands of the filters used for the negatives must also have a slight overlapping in order that the colours recorded shall by their combinations as light mixtures correctly render in complementary colours all the intermediate tints and shades as they are seen in nature or in the spectrum; but for the positive plates, it is preferable that the filters have abrupt absorption bands. Figs. 2 and 3.

By employing subtractive filters upon the plates intended for making the negatives the conditions necessary for obtaining almost perfect colour records for the printing blocks may be obtained. This is due to the fact that the negative image, which is represented in complementary colours, is now copied upon three positive plates (panchromatic) in monochrome, *interposing* between the source of light and the printing frame in which the copies are made, additive filters or filters having almost abrupt absorption bands and allowing the light passing through one series only of the filters of the negative plate to be transmitted through the monochrome filter, but modifying it in such a manner that a correction is possible of much of the inaccuracy due to the manner in which different sensitizers and colour filters behave. To accomplish this it is desirable that the polychrome screens intended for the negatives shall be adjusted particularly with a view to reproducing the spectrum in complementary colours.

The absorptions of the filters are such that the overlap between the red and green will render the sodium line D in its proper position; almost all filters for three-colour work inevitably record the yellow in the yellow-green of the spectrum, and render the D line as orange. This is readily detected in copying

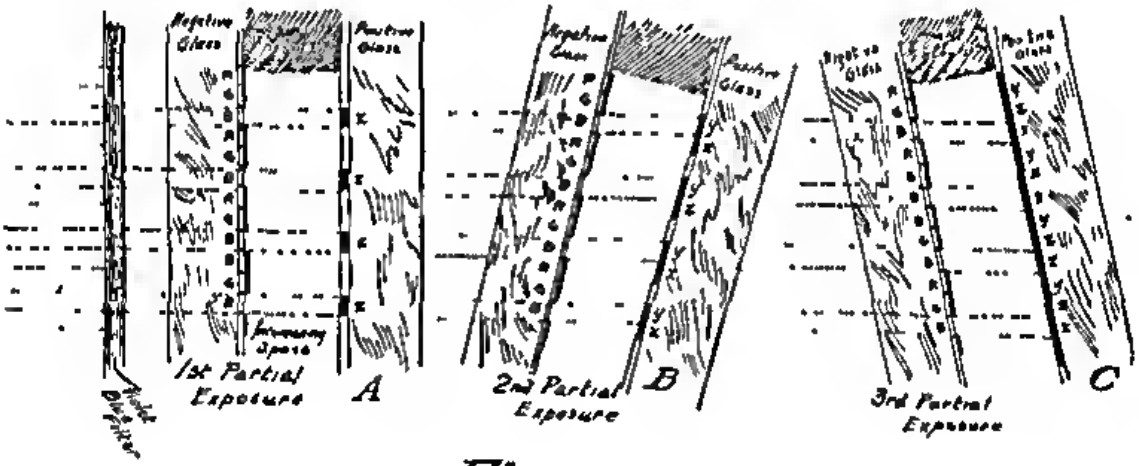


Fig. 4.

the spectrum on a "Florence" plate if the corrections of the overlap have not been made, but it requires considerable work to ascertain this visually by a reproduction of the spectrum by the three-colour process.

An excellent illustration of this difficulty and means of rectifying it appeared in the Photographic Journal of the R.P.S., October, 1904, in a paper describing tests carried out at the L.C.C. School of Photo-engraving and Lithography.

As a negative is a means to an end only, the general tone or colour of the negative plate is of no consequence, our object is to obtain upon this plate as nearly as may be a correction of the unequal renditions of the absorptions through the colour elements formed upon the plate. We must bear in mind, however, that in the negative secured upon this plate the colours which transmit the light and correspond to those of the object photographed will be covered up on development by the silver deposited over them Assuming the object to be a pure yellow, or the wave length at D of the spectrum, the red and green bands or filters should be completely covered and only the blue bands or lines upon the screen plate remain transparent. In making the positive record through a monochrome blue filter we should therefore secure an image for the yellow printing

block only, as the blue bands would be completely cut off by the red and green monochromatic filters, provided they did not transmit blue light to record green, blue or pink, which add black to the yellow on the print.

Should, however, the plate record a feebler image of silver over the green lines upon the negative representing the yellow or D line of the spectrum, we would have a greenish blue which would, therefore, be recorded on the print or positive as pink in addition to the yellow rendering it orange. An overlap of both red and green, if it extend too far, would produce too wide a band of the yellow, and should either of them transmit a little blue the yellow in the print would be mixed with white.

While this decliacy of adjustment necessarily requires the additional labour of preparing two sets of absorption filters, it has an advantage that when once successfully carried out by a process that guarantees its constancy it eliminates the uncertainty that characterizes the making of separate colour record negatives

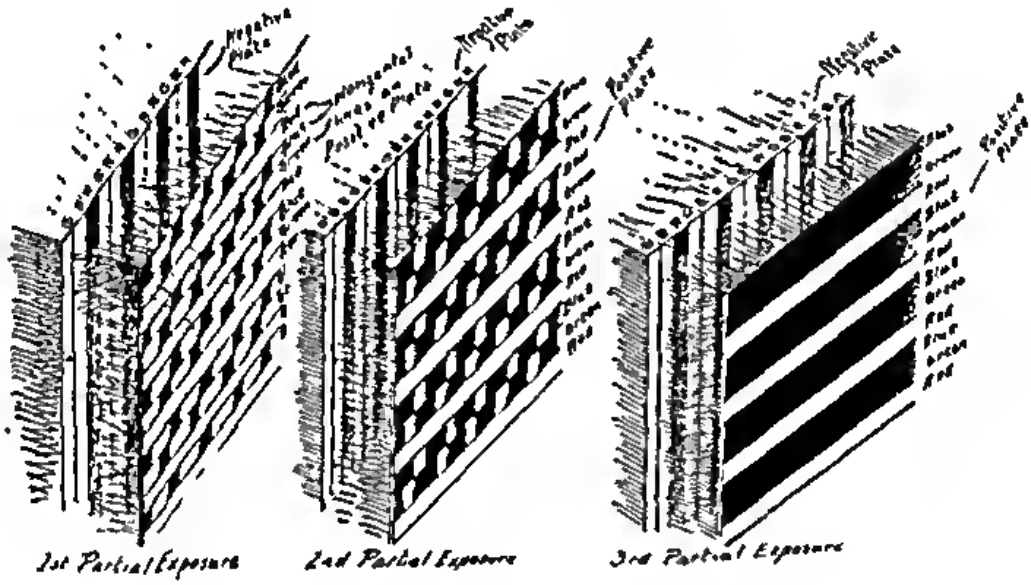


Fig. 5.

Photograph of a red object is represented by opaque vertical lines on the negative, and by shifting during exposure, reproduce on development as transparent horizontal lines in red on the positive.

with separate colour filters. The important point which is gained is that the sensitiveness of the emulsion, and its adjustment to the filters upon the negative line screen plate are such as to record more truthfully the correct absorptions with the additive filters, and the emulsion employed upon the plates used for positive records.

With the recent perfection of special panchromatic dry plates for process work, with which the colour screen half-tones may be made direct, and also by the use of collodion emulsion, which has answered satisfactorily in this way, the Florence plate will find its greatest field of usefulness in the reproduction of scenes from nature and the copying of paintings under conditions which would be more difficult, uncertain, and in many cases quite impossible at the present time. The fact that instantaneous views may be made upon extra rapid Florence plates provides a possible means of applying them in the near future to the coloured newspaper and to magazine illustration.

The unique and simple method which has been employed for printing the positive records should appeal to the process worker on account of its simplicity The negative in complementary colours is placed in an ordinary printing frame, and upon it is laid a metal or cardboard mask about $\frac{1}{50}$ of an inch in thickness, or, if desired, a thin sheet of glass or transparent celluloid may be employed The film side of the panchromatic positive plate specially intended for this purpose is laid over the negative, mask or thin glass, etc., for providing a slight separation between the two The exposure is made, through the negative, to a direct source of artificial light—incandescent electric or gas answers admirably—the selective filter being interposed between the light source and the printing frame

Two things are evident, if one stops to consider the result of copying from sub-divided line negatives and the production from them of a positive in monochrome for half-tone reproduction The first is: If a sharply defined image is printed the image which is formed upon the negative plate, over the green lines, for example, is copied through our green filter, but on examination with a magnifying

Fig 6

Portion within rectangle shown enlarged in Figs 7 and 8

glass the positive image will only cover one-third of the area of the plate, the interval between the lines representing the positive taken through the green lines is perfectly white or transparent. Here, then, we have only one-third of the surface carrying the image, the balance being white.

In the second place our image thus formed in lines is liable to bring about complications in copying through a half-tone cross-line screen; not only is there likely to be a moiré, or pattern, formed at some one of the angles required for obtaining the three-colour blocks, but to hope to register the three lined images parallel to each other is quite impractical, if not impossible, commercially.

The following simple expedient removes both difficulties at once, and is similar to that employed in the Brasseur Sampolo process, devised some years ago. It has the advantage over that process in that no opaque lined screen or registration of a lined screen upon the image is required, as is specified in that method of triplicating the lined image.

Fig 7.

Enlargement from contact print without shifting the frame during exposure See Fig 6

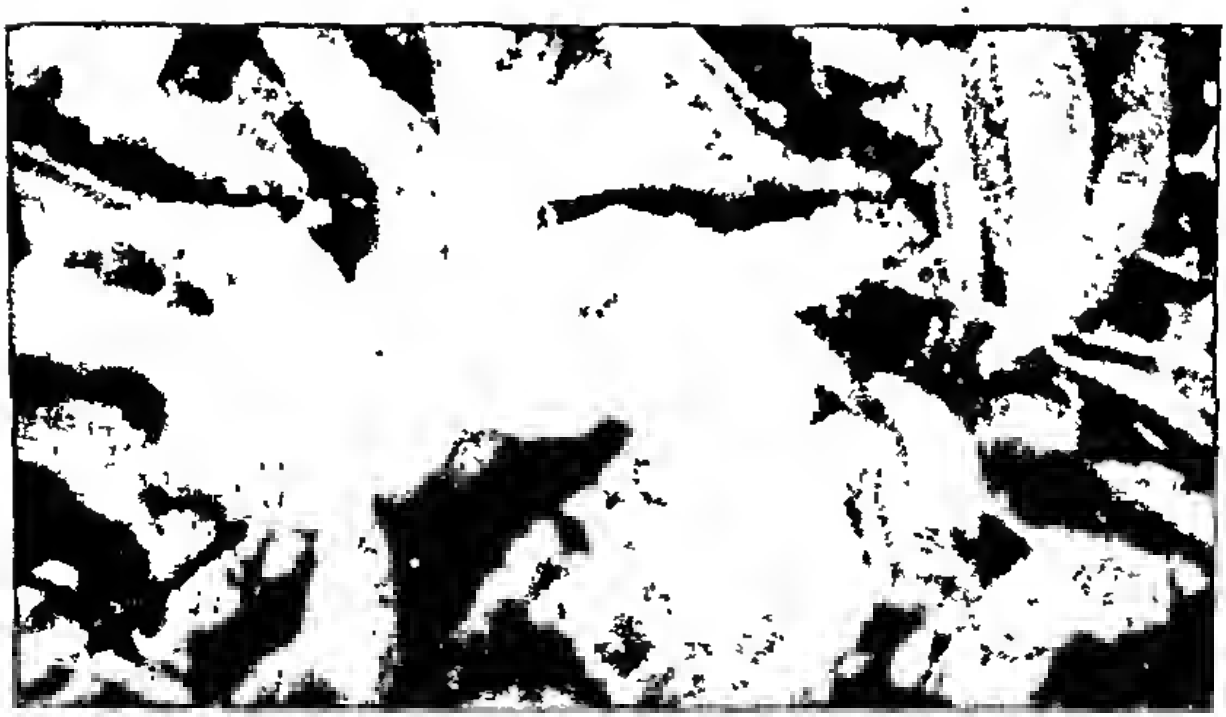


Fig. 8

Enlargement from print made by triplicating the image during exposure. See Figs 6 and 7

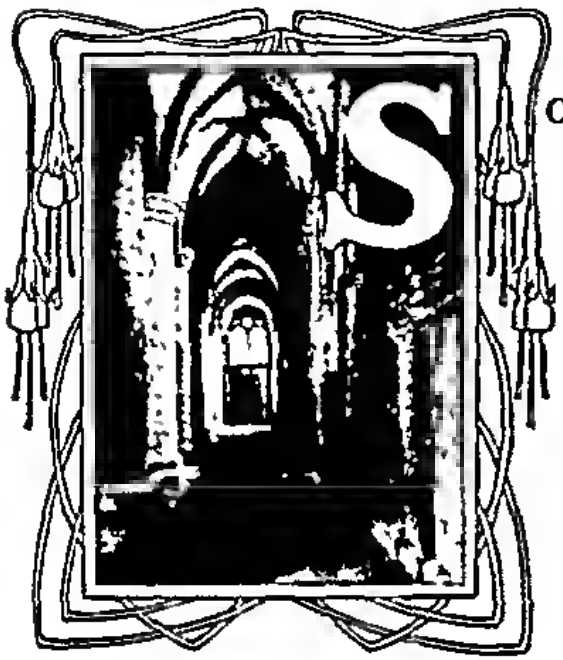
WEBSTER.—*South Kensington Museum.*

A VILLAGE CHOIR.

Negative and Collotype by
Fortescue Wetherman & Co., Ltd.,
Enfield.

SOME CAUSTICISMS ON THINGS IN GENERAL.

By FREDERIC T. CORKETT.



St Magnes Cathedral, Orkney
(South Aisle)

Block by London Etching Co — Photograph T Kent

SOMETHING for the Annual, Mr. Gamble? Yes, certainly.

Perhaps the first thing that surges to my mind is a desire to tell those readers of the Annual, who are large buyers of pictorial matter, that *quality, quality, quality tells every time.* The one desire in many of the large commercial concerns seems to be to get quantity first and almost invariably quality never. Now, the Annual I know goes to everyone (or should do), who is associated with illustration and reproduction. My appeal is, therefore, for better work.

Everyone is a process expert now-a-days; everyone seems to know more about tri-colour and process than those who are practical workers, and who are really in the know. Hence, one is ever met in commercial life with the man who knows something, and attempts to floor you with some exasperating apparent proof contradictory of a statement you have made. Thank goodness, however, there are still some good firms who will pay a fair price for their originals and artistic work; who will not push the process engraver down to an absurd price; who do not think half-tone at 5d. or thereabouts per square inch the price at which the engraver is likely to give the greatest satisfaction; nor expect an edition printed for about the cost of the material alone.

During the last few months I have had some astounding experiences of prices paid by some of the larger firms of pictorial advertisers. For instance, a friend of mine introduced me to a firm who is running a special product for the breakfast table. He told me that the proprietor would surely give me an order for several million post-cards. Naturally I was pleased. It was quite right; there was the order, but the price was 5s. 6d. per thousand, this being the price this customer was paying. There were four printings, *i.e.*, illustration in three-colour half-tone, and, of course, the usual printing on address side. I have during the last few years ordered some hundreds of tons of post-card board, and the price paid for this worked out as near as possible to 4s. 3d. per thousand, when overs and spoils were taken into consideration. A really good board, of the requisite substance, could not have been found at less, no matter what quantity was taken. Such a board as this in this proposed order was, of course, out of the question. But what about the printing, the blocks, originals,

all of which had to be included in this price? It was useless to point out that these post-cards were not post-cards at all, that they were simply thin paper and cheap and indifferent work, with no attempt at art reproduction. It was useless to point out, too, that they could never be used for the purpose in view, that the advertisement was the cheapest and nastiest, and it was a real waste of money.

Now, who is to blame for all this? In the first place, the printer who estimates for such an article, for his only excuse for taking such an order at all must have been to keep his machines going. There would have been next to no profit out of it. The job was not put through for fun, of course, but the users, when they thought the matter out, I am sure would come to the conclusion that their money had been wasted. A respectable printing firm, who should at any rate have had their clients' interests somewhat at heart, should have suggested a better card, and something that would have done the customer real good. Had these people (who were very good people) had a first-rate article submitted them in the first place, they would more likely have considered it, and the printer would have stood a chance of getting good repeats. Yes, the printer was to blame decidedly in the matter.

As another instance, a few weeks ago, another large firm wrote to me to go into the matter of an art production. An Art production, mark you, they wanted! They wished to bring out a booklet of a particularly attractive nature. One of the firm posed, too, as a process expert, and here I expected to get at least some sort of fair consideration. This expert, however, had never heard of or seen the PROCESS ANNUAL, and his expertness consisted, so far as I could understand, in using a Folding Kodak Camera, and sending a few films out to be developed and printed. Well, I sent in my suggestion with a scheme for the illustrations required. The artistic work, originals and blocks, came to £60. The originals were well painted, the blocks well made, and a fair price paid. This material was handed over to the "expert," but contrary to my advice, he placed his order with a firm of printers who had next to no experience in printing tri-colour. Their price naturally was considerably less than the firm who knew what they were about. The paper used in the edition was altogether unsuitable, and the work when finished was, as I expected, almost useless. "The ship spoiled for a ha'porth of tar," and this by the firm's expert! He knew the printers could do the work; he knew the paper was all right. Of course, he then felt sure the blocks were wrong, that they had been faked in the correction, etc., and the printers could not possibly get the results as the proving. Those printers too! First the blocks are wrong, then the paper or board is wrong, the atmosphere has affected the material on the way from the paper mills to the printers, the proofs have been pulled on a flat surface, and dodged on a hand press, and so on, and so on. Of course they could not be expected to get such results as the proofs! Their own incompetence never occurred to them as a possibility.

I find, too, in other directions so little understanding about the suitability of an original for tri-colour, that even serious firms, who should know better, think anything that looks well can be reproduced satisfactorily in tri-colour. There never was a greater fallacy. Most originals require, and all are capable of and better for, careful adjustment for process reproduction. This is not possible, however, to the same degree with water-colour work, for very often the photographic camera searches down to the underlying colours, and one really cannot get the result the water-colour original on its surface presents.

It is curious, too, to hear artists talk about their special knowledge of tri-colour. A friend of mine most seriously told me that he always painted with the primary colours, red, blue and yellow, so as to best ensure a successful

reproduction of his work. He could not see that there was anything funny about his statement. I am sure he thought it rather clever.

I do not think tri-colour during the last twelve months has made very much advance. Certainly most of the plate-makers are perfecting their work, and are in a greater measure better able to turn out a uniform quality than they did twelve months ago. The method, too, is not so haphazard. Judging from the vast number of plates that have passed through my hands, I can say that there certainly is a great deal of haphazard work sent out. When an engraver has to work at a fixed price, plates are often sent out when they should be absolutely re-made. The engravers should not, however, expect these to be accepted. These indifferent plates, indifferent in their proving, are worse in their printing, and it is very difficult to make the best of them printed at the same time with a number of plates that are fairly correct. Thus, the best cannot be got from the best plates, whilst the indifferent subjects are not satisfactory.

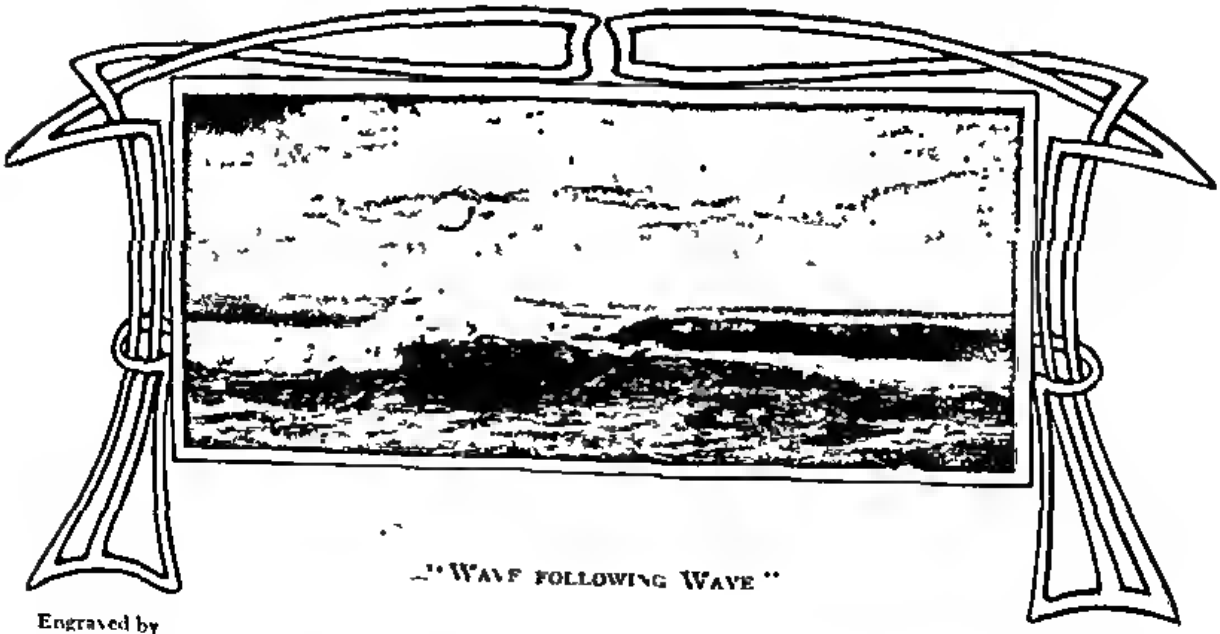
I was called in to pass an opinion on the tri-colour work that had been done by one of our largest printers for a well-known book publishing house, and I must say the first book that was shown me, although it was supposed to be something particularly well done, was spoilt in just such a manner as I name, and one of the worst plates of the whole was the frontispiece. For this work one can only blame the engraver, and he in reply naturally says that while he is fixed down to rockbottom prices there is no chance to re-make, or to continually re-prove to a state of high perfection. My plea all along is for quality. In such publications that warrant a fair price, I plead with the publishers to give the engraver and printer a chance, and not to expect the finest work at the cheapest price. It is not reasonable and cannot be done.

In the question of the preparation of original, I find very much the same thing applies. There are a vast number of indifferent artists who are Rembrandts or Constables in their own opinion, and who have the most wonderful originals to offer at prices which appears of some commercial value. I am speaking particularly of those artists who cater for the commercial requirements of illustration. If it be Pears' Soap, Beecham's Pills, or some other large concerns, these artists flock there, and send in their work on chance. Needless to say, many of the larger houses are surfeited with a deal of indifferent work, and the really good work that might be of particular service rarely gets a chance. Submitting design on speculation is no reputable artist's business, and is one which I certainly would not advocate or encourage.

My advice to all users of pictorial matter is, have your work specially prepared for the process, so that your engraver and printer can give you fine work. Do not buy unprepared haphazard work. In nine cases out of ten it would be far better to have the work specially prepared for the purpose in view.

As to the merits of three-colour over four-colour, most British engravers seem to be adhering to three-colour. They say the reason is they cannot get four-colour paid for. It means, of course, not only the extra cost of the block, but the extra cost of printing. In the main, I believe their contention is correct. On the Continent, however, four-colour is more in evidence than three. This is, of course the usual tri-chromatic inks with a strengthener, generally of a dark greyish or black tone. The impression seems to be that four-colour work is not done in this country equal to the Continent. The Anglo Engraving Co., however, insert in this volume, a most excellent four-colour example—"The Tragedy of Life." They have, I think, reproduced this picture particularly well. Owing to the variety of the tones of greens and greys, it is a difficult subject for trichromatic methods.

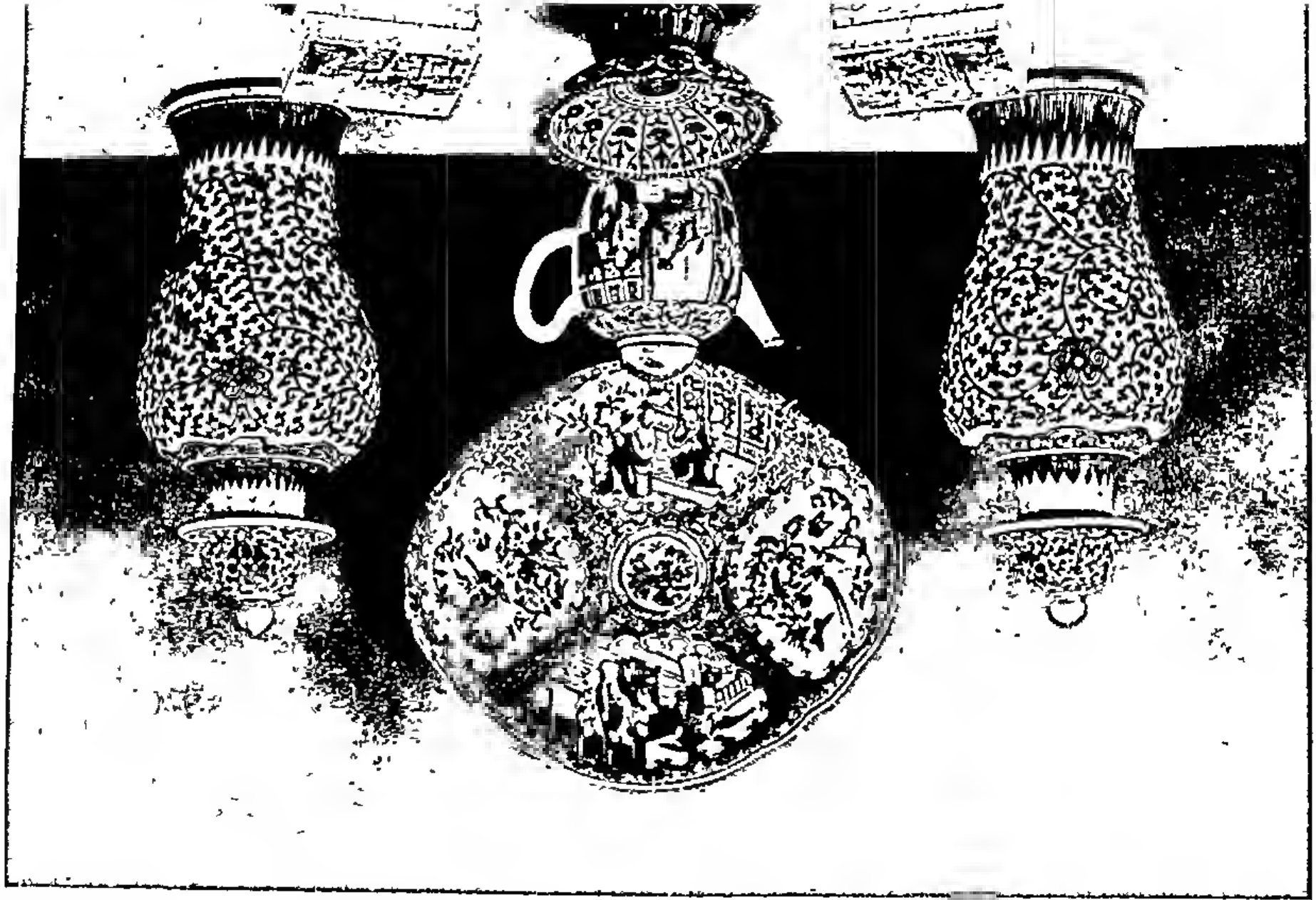
On the question of expense, in connection with art printing and reproduction, British traders seem at present to stand on a different pinnacle from American business houses. The American trader wants most often the best product, and he recognises that the best product pays the best. I noticed this particularly when in the States in 1899, and it is the same to-day. Many of the great trading houses in the States try continuously to go one better in printing than their rivals. If by a different method of engraving or printing they could get some striking effect, something new or novel, it must be sought after, and the engravers will be told to attempt this, whilst the artist would also endeavour to work up to this possibility. The question of price has never been such a ruling factor in America in the printing world as it has been in England. The Yankee is cute, of course, but he is not so foolish as to expect the finest work at impossible prices. The American railway companies, the great trading concerns, etc., all go in for good work They pay good prices for their plates, and the question of good stationery, good price lists, attractive advertising matter, is to them a very important feature of the concern, and they look after this much better in America than we do here. There is every sign, however, that English houses are beginning to see that the cheapest in the long run is not the best, and it is pleasing to hear the opinion of Mr. T. J. Barratt, the Chairman and Managing Director of Messrs. A. & F. Pears. In an interview the other day with a member of the press, he said: "Advertising paid when it was good advertising—when the article advertised was good, when the selected channels for advertising were good, and when the advertising matter itself was good. Complete success could not be obtained when there was weakness in any of these directions." With this I absolutely agree. Messrs. A. & F. Pears' post-cards, of "Bubbles," are art post-cards in the best sense of the term. The printing and art productions of Messrs. Pears are always attractive and well done, and it is very pleasant to hear from such an authority that good work always pays the best. If my present experience is teaching me one thing more than another it is that old truism that "there is more room at the top than the bottom."



"Wave following Wave"

Engraved by
Meisenbach Works

Photographed by
T. Kent



MADAME CHRYSANTHEMUM

Three colour blocks, by
THE ANGLO ENGRAVING CO. LTD.
14 Farringdon Avenue, London E.C.

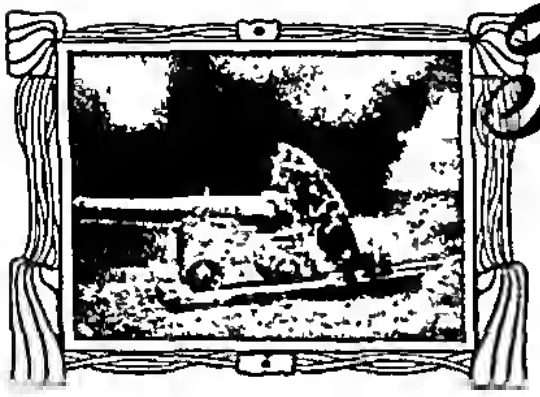
Three colour inks by
SHACKELL, EDWARDS & CO. LTD
5 Red Lion Passage, Fleet Street, London, E.C.

JUNE ROSES

THE ADVANTAGES OF PHOTO-LITHO PAPER.

By ARTHUR JAFFÉ.

(Translated by E. Mell.)



LONG TOM

Engraved by A. E. DENT & Co. Photograph by C. HALL.

TO reproduce by photography any original, either a line-drawing or a half-tone picture taken through a screen, on to stone, one uses nowadays almost exclusively photo-lithographic paper, its simple and sure manipulations offering many advantages compared with the difficult process of copying directly on to the stone. But, as we will show later on, this method of transferring can also be well used on substitutes for stone, such as zinc and aluminium. The great difficulty of applying to the heavy stone a sensitive layer and of exposing it to the light under a negative, is, of course, overcome by the use of such very light and flexible metallic substitutes, yet it is just this flexibility which makes it difficult to use the whirling machines for coating the plates. Only zinc plates as used for relief etching can be readily coated with a chrome-albumen layer, as they have the necessary stiffness, and it is with good reason that in this branch of zinc etching the chrome-albumen or similar processes have conquered the field. But here, also, in cases where cartographic drawings, etc., are to be dealt with, and where one has no prism at disposal, the photo-lithographic paper is the only reliable medium, as the turning of the film bearing the picture, which is necessary for direct copying, may easily cause distortion or bending of the lines.

Coming back, however, to our principal subject, that of surface printing by taking the picture photographically, the advantage of transfer paper is readily demonstrated, for, as we have already said, the prism or mirror and the risky and tedious process of reversing the collodion film by stripping is superseded. The printing of the transfer paper is done with certainty, as the exposure can be easily controlled. After a certain amount of practice, such a degree of certainty can be reached that a misprint cannot result.

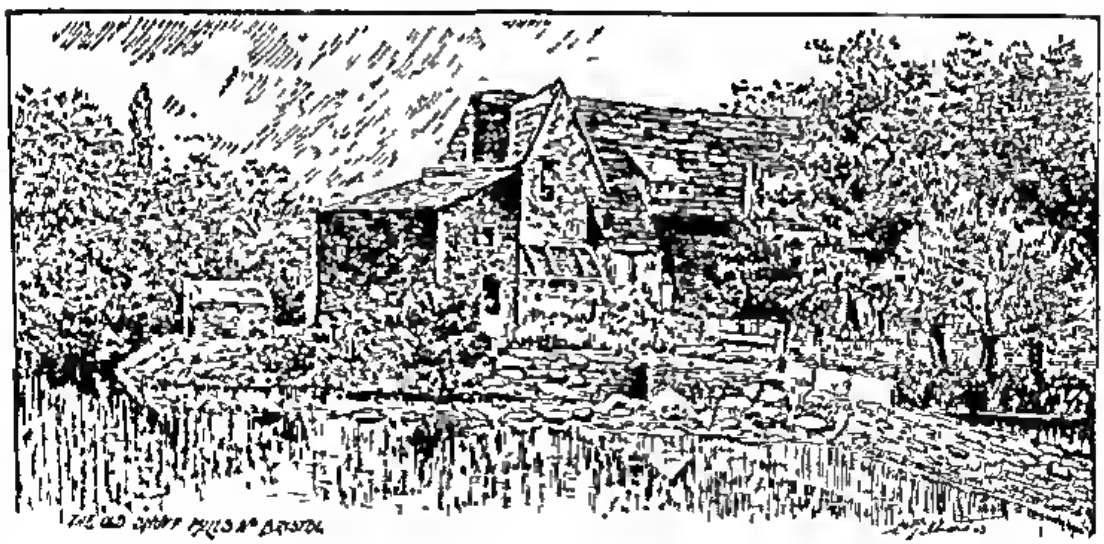
The important point, however, which should determine the stone printer to do his photo-lithographic work by means of the transfer paper is the following: Whilst the printer can put together his blocks with the type in the press in such a way as to obtain as large a printing size as possible, the lithographer, when he has small sizes to do, has to make them up all together upon one stone, or plate of zinc or aluminium. The direct copying of small negatives separately on to a plate of large size is very irrational, and in the most cases not practicable at all. On the other hand, this problem is solved in the most rational way by the use of transfer paper. When the transfer prints are ready they are damped and placed on a piece of cardboard marked out with the corresponding divisions, whilst the bare parts of the paper are perforated with a sharp instrument. The

whole sheet is now laid down on the stone or plate and the transfer done in the usual way, as described in the instructions.

If a fine line drawing or a screen reproduction has to be transferred on zinc or aluminium, it is necessary to powder the photo-litho copy with a mixture of wax, resin and asphalt, as mentioned in the instruction booklet* for "Eagle" papers. These transfers can be preserved a long time, but have to be bathed in a solution of alum before making the transfers. If, however, the drawing is of a coarse nature, one can make the transfer in the same way as upon stone.

Finally, I ought not to omit mentioning the transfer on stone, which can be done by making the original drawing upon transfer or autographic paper. This way has the advantage of being cheaper, but as fine drawings are not easily done on transfer paper, it is only recommendable to be used when the reproduction has to be of the same size as the original. Further, there is always the risk of the original being spoilt. If the making of the original involves much labour and time, it is advisable to adopt photo-lithographic reproduction, which is a little more expensive but more certain, and especially as the resources of modern reproduction, as well as the quality of photo-lithographic papers are of such a high standard, that by working carefully none of the beauty and precision of the original is lost.

* "Photo-Lithography with Transfer Papers," gratis, from Penrose & Co.



Line Block by
Fabian, Howell & Co

From Pen Drawing by
W. Gilliard.

HAPPY THOUGHTS IN PROCESS WORK.

By H. VAN BEEK.

RESEARCH

Engraved by MEISENBACH WORKS. Photograph by H. VAN BEEK

MANKIND cheers success and doesn't quarrel about the means by which it was attained. What toil, skill and patience have gone before, what days and days of watching and weariness! Hope often deferred has made the best worker impatient; year after year has dragged on, the end seeming still afar off, and people are apt to let matters stay. All that counts for little or nothing if the long struggle does not close in victory. It is the history of process engraving—of colour printing—which gives rise to our somewhat pessimistic opening.

However, the keen observer sees no staying at all; he waits results—only the missing link, the "happy thought" is wanted. Success in life depends a good deal on "happy thoughts."

The light filtering through a screen before it is allowed to attack the silver component of our sensitive plate in colour work seems to be the point from which future success has to start. In the earliest days of colour work the filter was placed before the lens. Then we put it behind the same and next in the dark slide. In moderate sizes it was well known that the best results were gained when the light filter was placed directly before the sensitive plate. The method is, however, too expensive for commercial sizes, and, after all, there is no place left for the screen. A smart process man sealed filters and ruled screens together. He saves space, gets rid of the optical disturbances of former methods, but increases exposures a good deal.

Now the happy thought comes in. Sensitize your plate correctly as the filter requires. Stain your sensitized film so much as to allow only the light wanted to penetrate to the silver compound, and thus were the chromo emulsions of Dr. Albert, of Munich, evolved. Exposure now is diminished enormously and all optical sources of failure are done away with.

The light filtering medium is now brought nearer to the plate than one could have thought. It is put into the plane of the image and the costly glass tanks and plane parallel tools have been put aside.

Youth now entering process will accept smilingly the methods worked out without thinking of the men who have been dragging, sniggling and dibbling after such a happy thought as that which led to this success.

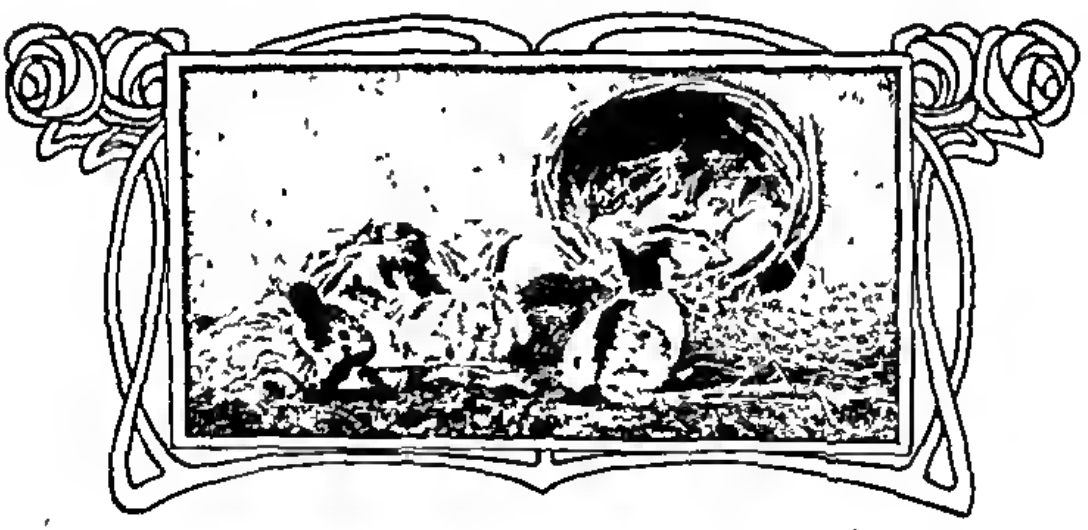
It is sure as death and taxes that an author, having lost his scissors, finds the best copy to talk over in the question-box of his business paper. Such a box is a

good areometer for testing the craft and its knowledge of the business. Someone across the herring pond tells us in the question-box he has found out a new method of stopping-out for fine etching. And after all it is only a simple, black-looking lithographic crayon. In his country the trade is not acquainted with this crayon, though it is an old question with up-to-date workers on this side. Lacquer and liquid inks which need only strong heating without powdering for the solids, and crayon for the detail and half-tone, is general practice. Is it a new line?

Certainly, in many shops of Great Britain fine etching is done on unprepared ink films. Ought we not to have outlived this? After all, three to five answers in the box have reference to such powderless preparations which must be handled carefully like eggs, where cutting away the light-dot with drops of stronger acid is a serious danger, and topping some detail with crayon is altogether an impossibility.

Here is an opening for a happy thought, for fine etching, even in the best managed process department, is a rough handhog of tone values, spoiling relation of all that was good in the copy.

Process in black is staying, says the man in the street. Is it sure to do so? It should not be forgotten that serious progress even in colour work has to start from the black department, which must work out a method giving better control of tones, not only for art, but also for commercial work.



"Bunnies"

Engraved by
The Marshall Engraving Co

Photograph by
Jas. E. Tyler

PHOTOGRAPH BY ALFRED ELLIS & WALERY

EDNA LOFTUS.

W. F. Sedgwick, Ltd.

PHOTOGRAPH BY PAWSON & BRAILSFORD.

CRUCIBLE STEEL CASTING.

PHOTOGRAPH BY E. O. HOPPE

HEAD OF AN OLD PEASANT.

Hamel & Co.

PHOTOGRAPH BY ALFRED ELLIS & WALERY

Swan Electric Engraving Co., Ltd.

PHOTO BY ALF ELLIS & WALERY.

CLEOPATRA.

Half-Tone Engraving Co., Ltd.

SOME CHEMICAL OBSERVATIONS ON THE INTENSIFICATION AND REDUCTION OF HALF-TONE NEGATIVES.

By Prof. RODOLFO NAMIAS.

(Translated by E. Mali).

DECORATIVE TREATMENT OF FLOWERS

Photograph and Design by
FRANK W. ADAMS.

IT is beyond doubt that the perfection of half-tone blocks depends very much upon the way the intensification and reduction of the screen negative is carried out. It is useless to explain here the reasons why the intensifying and reducing is necessary. The play of tones and half-tones produced by the screen needs absolutely to be regulated and completed by chemical manipulations, which, rationally conducted, can lead to what represents the desideratum of a dotted negative, namely, dots of different sizes, according to the intensity of the lights and shades they are representing, but all equally opaque.

It is a mistake, according to my way of thinking, to believe, as some do, that when gelatino-bromide plates are used for half-tone the reducing operation can be dispensed with; on the contrary, I would reiterate, that it is rather more necessary than with collodion, because the penumbra around the dots is here still more marked and causes much greater diffusion of the luminous action, which is now remedied by placing the screen appreciably closer. But it cannot be remedied altogether in this way, not only because the screens as now made render it impossible to bring the network closer within certain limits; but also because, admitting that the distance could be brought to the minimum distance desired, it will be seen that beyond a certain limit there is an inclination to get the image with the tone which is proper to it, but only divided into minimum elementary surfaces by the screen.

The effect wanted, namely, the expression of the value of a given tone with dots of uniform density and producing to the eye a similar action to the light and shade of the original, will in this case be missed

Observing in photo-mechanical studios the reduction and intensificatic as usually done, I have verified that it is in these operations that the large amount of wastes occurs. And this happens for two reasons: First of all, tl methods used are generally not the most rational ones, from the chemical poi of view, and moreover the operator does not employ them in the best way.

I wanted to get to the bottom of this interesting argument by numero direct proofs, and I have made for this purpose a number of screen negativ either in wet collodion or gelatino-bromide, proving afterwards the action of tl different reducers and intensifiers.

I summarise here the results at which I have arrived. As regards tl reduction processes, in which the silver is at first changed into a haloid sa (generally iodide), which is afterwards dissolved by a solvent, they are, in n opinion, to be rejected.

It is well known that one of the most used methods consists first in tran forming the silver of the image into silver iodide, making afterwards to act on a very weak solution of potassium cyanide, for the purpose of removing tl silver iodide.

As the eye cannot follow the first operation, which is the transformation in iodide, it is evident that mistakes of judgment are very easily made, and t one who has not had long practice does not generally succeed in saving a sing negative; whilst the one who has had the practice, repeats usually the treatme with iodine and cyanide in a such a way as to produce many small actions, whi add up. But in spite of using every precaution, it very often happens that sees the dot vanishing in the shadows, and the negative has to be rejected.

Probably the reciprocal action of the two baths, which are not perfect eliminated from the film, by the summary washing which is done between the o and the uther operation, exercises, too, an injurious influence.

I am of the opinion that for the reduction of screen negatives only tho methods ought to be used in which there is one solution only for removing t silver. In our days we have many very good solutions which will do this. excellent one is the solution made up of cyanide of potassium and red prussia of potash (cyanide of potassium 10 or 15 parts per thousand with 3 to 5 parts p thousand of red prussiate of potash). To avoid the use of cyanide, howev which many besides myself do not advocate, one can have recourse to t solution of permanganate of potassium, acidulated with sulphuric acid, or nitr acid, which was first recommended by me in 1899.

At the present time many Italian operators make use of this solution f screened collodion negatives, and prefer it to all others. Although this soluti only gives to the collodion negatives a very slight coloration, it is recommend to use a second solution consisting of 1 or 2 per cent. of bisulphite of soda metabisulphite of potassium for the complete clarification.

In making trials with this same reducing bath on screened dry-plate negativ I noted that it does not work quite suitably, because in this case it does not a preferably on the halo of the dot, as is done by the cyanide and red prussiat but acts appreciably upon the whole dot in such a way that one has much mo difficulty in attaining the desired effect.

This confirms what I had to say in my first communication, that the reducu action of the acid permanganate comes nearer to that of persulphate than that of the Farmer reducer.

Now, however, some authors who at first did not seem of this opinion, adm that the reducing action of the acid permanganate is in its effects between th of the persulphate and the Farmer reducer.

However this may be, as the acid permanganate cannot be used for screened gelatino-bromide negatives, the only resource is the solution mixed with cyanide and red prussiate, or to that of hyposulphite and red prussiate. The solution mixed with cyanide and red prussiate is always perferable to hyposulphite and red prussiate (Farmer reducer) for two reasons: (1) because it keeps for a long time and does not become completely exhausted from one day to the other, whilst it is noted that the solution mixed with hyposulphite and red prussiate is rendered useless in 5 to 10 minutes through the very rapid reducing power which the hyposulphite has upon the ferricyanide of potassium, whilst such a reducing action is without resemblance in the case of cyanide; (2) because hyposulphite needs longer and more careful washing for eliminating it, as slight traces will influence injuriously the successive operations of the intensification.

And now I will say something about the intensification. The method most used for collodion negatives consists in the treatment of the plate with a solution of sulphate of copper and potassium bromide, and afterwards with silver nitrate.

The first treatment transforms the image into silver bromide and copper bromide (Cu_2 Br_2); in the second treatment the reducing power of the copper bromide give silver, and in the same time another quantity of silver bromide is formed, whilst copper dissolved in form copper nitrate. In this way a considerable quantity of silver bromide is added to the silver of the image. If thought desirable, the treatment can be repeated, and in this way the opacity increased more and more. It is, however, right to observe that the bromide of silver having a sufficiently transparent colour, the intensification which is obtained in this way is never too great.

It would be rather good to complete the intensification with a treatment of sulphide of sodium, which would produce sulphide of silver.

Generally, however, it is not done, because a yellow stain is very easily produced; but if care be taken to treat the negative with a solution of nitric acid 5 per cent. for a few minutes and afterwards with water, I have noted that this trouble does not show itself.

With collodion negatives intensification with bichloride of mercury is difficult to do, and is, in my opinion, not the most advantageous. In this case the method of intensification which I have found, for a long time past, superior to all others for the collodion process, is the one based on the transformation of the image into ferrocyanide of silver and of lead, and successively into the corresponding sulphides.

The reason for insuccess which this method gives in hands of many is very simple. When the negative is taken from the solution of nitrate of lead and red prussiate, in which it has been whitened, and put into the water to wash, there is formed upon the film a deposit of lead salt (mostly carbonate) which cannot be eliminated by any washing.

In such a way, when the negative is passed into the solution of sulphide of sodium, besides the blackening of the image, there is a coloration more or less general all over. But this inconvenience is completely avoided by taking the precaution of applying to the washed negative a solution of nitric acid (2 per cent.) or acetic acid (5 per cent.), washing it again afterwards.

The solution of lead nitrate and ferricyanide can be prepared by mixing equal quantities of a solution of 10 per cent. lead nitrate and 10 per cent. red prussiate. This mixture is supposed to be rapidly exhausted, yet I have noticed that, although giving a deposit which increases by keeping, the limpid

liquid poured out after seven days (and kept without any precaution) has been still acting well.

I always add to the solution 1 to 2 per cent. of acetic acid, because even a slight acidity of the bath is useful for preserving from general fog in the treatment with sulphide of sodium.

By working according to the above indicated conditions, the treatment with sulphide of sodium blackens the dots, leaving the remainder perfectly transparent.

The opacity which is obtained is the greatest which can be obtained through the intensification of the collodion image, and besides there is the advantage that the dots enlarge themselves in the high-lights, the joining up remaining perfect. I tried to use this last method of intensification on screened gelatino-bromide negatives, but it was impossible for me to avoid completely the general discoloration

The image in this way is not superficial, as in the collodion process, but distributed in the thickness of the gelatine, which after having imbibed the lead salt holds it in small quantities with such a tenacity that with a prolonged treatment of several hours in nitric acid, 5 per cent., the complete elimination cannot be attained.

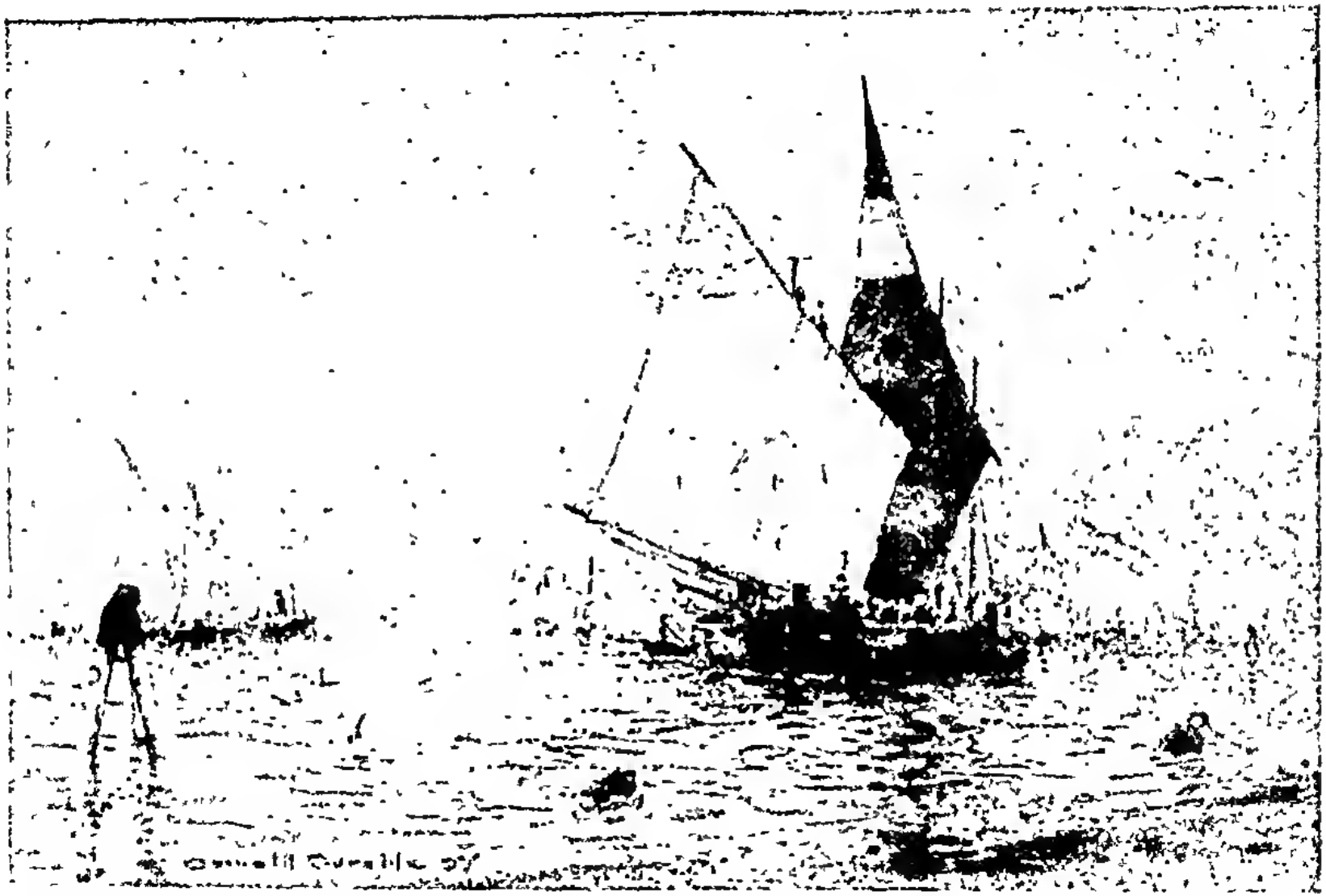
For screen negatives on gelatino-bromide plates there is nothing left but to have recourse to intensification with bichloride of mercury, but instead of using a simple solution of mercury it is rather convenient to use a solution of bichloride of mercury with 5 grm. per litre of potassium bromide added.

I verified in this way that there is a greater enlargement of the dots and also a better joining up in correspondence with the high-lights of the subject.

This is the more important with gelatino-bromide plates, as the distance of the plate from the screen necessary to produce a clean, sharp dot without excessive penumbra does not allow of a sufficient joining-up of the dots in the high-lights, so that after the reduction the dots corresponding to the whites are generally separated. An intensification which enlarges as much as possible these dots to make them join is, therefore, almost a necessity.

The blackening of the image after the mercury bath is usually done with ammonia. I beg, however, to remark that if the negative has been obtained without a prism, and has in consequence to be reversed, it is convenient to detach the film when simply whitened with bichloride of mercury. In such a case the film may be hardened by using a chrome alum solution, as advised by me since 1902 This acts more efficaciously and with less trouble than formalin solution. When the film has been hardened, it is detached from the glass by means of a solution of hydrofluoric acid, or better still, sodium fluoride acidulated with sulphuric acid, then it should be washed, and after being blackened with ammonia, it is made to adhere to another glass plate by using a weak solution of gelatine, taking care, naturally, to reverse it.

If the solution of chrome alum were applied to the intensified, finished image, there would be an alteration of the image itself as a result of the chrome alum bath.



INKS BY.
ELLIS WIBORG & CO

TRUE SCALE PRINTING ON ALUMINIUM.

By "D. BLOOD."

"We're Come."

Engraved by "Western Mail," Limited

Photograph by Martin J. Ridley.

Y this method it is possible to command exact size of reproduction, which is very important in maps, plans, etc. Lithographers can work it without going to the expense of buying a camera, etc. The way of operating the process is as follows:—

Take an aluminium plate grained either by hand or by means of the graining machine (the machine for preference) Then prepare it with the following solution. Take 2½ drams of sulphuric acid and put into a Winchester of water; well clean with a piece of flannel the surface of the plate Rinse well and coat with sensitizing solution two or three times in yellow or ruby light (this is essential), seeing that there are no "comets" on the plate. Then place in whirler and whirl slowly until dry. If it is too fast the solution will whirl off too thin, and then the plate is spoilt. A good thick coating is wanted. Do not get it too hot. Then place in vacuum printing frame, lay tracing on plate, and pump up frame. Expose to light. This is about the most important point of all. Do not over or under-expose; a little practice will enable one to get the proper exposure. If on ordinary white tracing paper and good black ink such as process black, two minutes' exposure will be found enough. Of course, this will depend on the strengtb of the light. I am using two 15-ampère arc lamps together about two feet from the frame. Develop under tap. Dye up with methyl violet and give a good wash under water. If the dye sticks to the whites, gently rub away with cotton wool; you will, of course, have the reverse of tracing. The blacks are whites and whites will be blacks. The plate should have a silvery look about it on the whites in this stage. When dry prepare the plate for reversing. Thus, put 1 oz. of nitric acid (com.) in 10 of water, and rock plate in bath for four minutes. This will clean the whites perfectly; unless they are perfectly clean, when tbe plate is rolled up and developed out, the ink will wash away from lines. After four minutes take out plate, well wash under the tap, not with a strong pressure of water or film will wash away, as it is in a very weak state now. Dry, and look to see if it has got a nice silvery appearance on the whites. Then roll up with transfer ink (Penrose's Eagle Brand); after the ink has dried into the plate, develop as a line print, when you will rub away the ink where the sensitizing solution has been; and the ink will remain firmly on the parts where the light did not get through the tracing, so that that

which was white after exposing becomes black, and you have the tracing reproduced on plate. Gum up and treat as you would an ordinary photo-litho transfer direct on aluminium.

Cause of troubles may be :—Dirty aluminium ; too thin a coating of bichromate solution ; if thin it washes away in acid bath and rolls up dirty, so that you cannot develop. Over-exposure causes the film to get too hard, and you cannot develop ink from plate after reversing. Under-exposure washes away under tap, film too soft.

All the appliances and materials for the process can be obtained from Penrose and Co.

"Our Little Nipper"

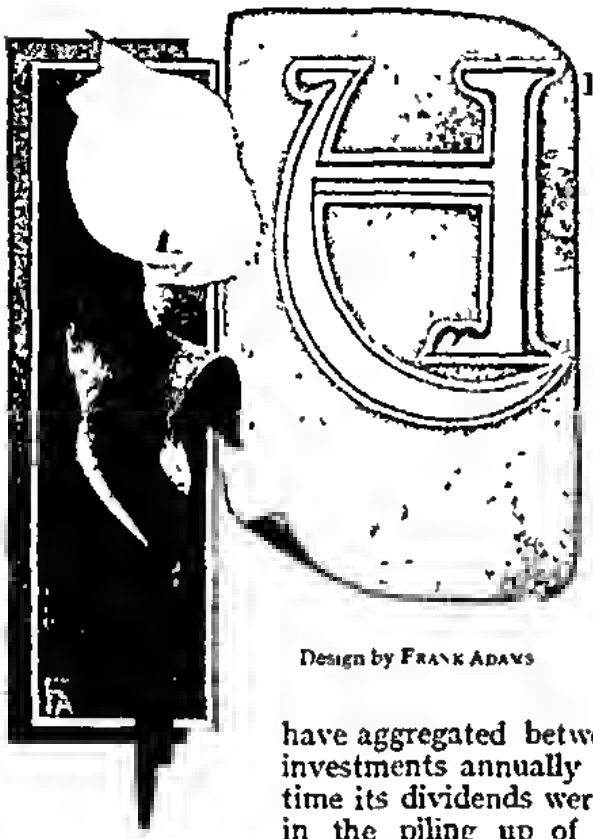
Block and Design by
The Acme Tone Engraving Co, Ltd

Photograph by
C. W. Perry

MAKING MONEY.

By WM. HUGHES,

Editor of "The Engraver and Electrotyper."



Design by FRANK ADAMS

HIGH wages have been secured generally through labour unions. Doctors charge as much as each patient is likely to stand. Lawyers take the lion's share of everything within their reach. It is in human nature, under normal conditions, to secure as much as circumstances may permit for services, for work, for goods sold, for the products of special talents, etc. The Calumet and Hecla Copper Company has been paying between eight hundred and nine hundred per cent. annually on the investment of their stockholders for some years past. A hundred per cent profit is as common in this country as that much or more can be realized. The grossly maligned Standard Oil Company's dividends have aggregated between forty and fifty per cent. on actual investments annually for a few years past. For a long time its dividends were much less. It is the most moderate in the piling up of its percentages of profits of all the successful "monopolies."

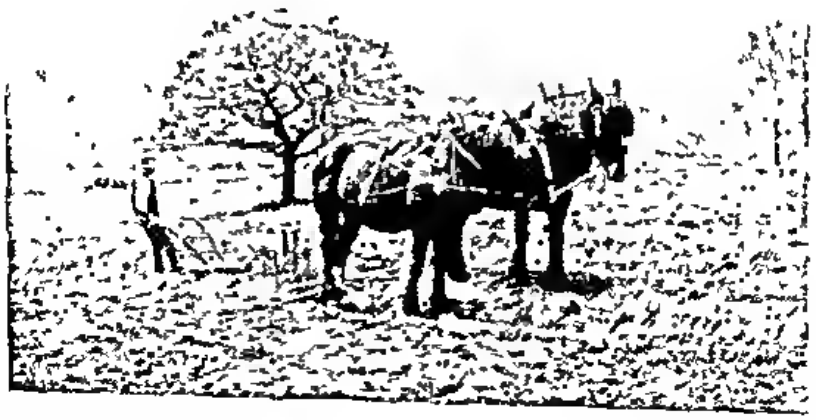
And therein is one of the secrets of its wonderful stability. It is not a "trust," by any means, in the prevailing sense of the term. The first wicked trust was established and conducted by Theodore Roosevelt, father of the President of the United States of America. He had inherited great wealth, but hungered for more through dealing in imported glass in New York city. "He made a combination in the glass trade which he kept up to taw by a dinner every Saturday at Delmonico's, at which he brought to book any member of the combination chargeable with underhand work. One or two such experiences was enough for the most recalcitrant."

The would-be "representative" photo-engravers, and some other makers of printing plates, in this country adopted that Rooseveltian method of running a trust. But they lamentably lacked the Roosevelt talent and honesty, or squareness, and have been discomfited every time. Although they provided "*bug-juice*" dinners, their game was easily seen through.

On the other hand, the Barnes-Crosby Company, and the few other plate makers who have followed the Rockefeller methods are making money, and are

gaining control of the business, in spite of the most unfavourable circumstances and conditions. And when they "monopolize" it sufficiently, then, and not till then, the profits on half-tones will approach the average profits in other businesses, which are conducted on honest bases. Large quantities pile up their profits.

This reminds one of the old lady selling tea cakes on London Bridge at a ha'penny each, which were so good and large that each cost more than she sold them for, she declared. A neighbour asked her, sympathetically, "Well, Mrs Jones, how in the world do you make your living, then?" She replied that she made her profits out of the large quantities she sold. This paradox exactly fits the case of photo-engravers, who make money here these days. Three plants have been closed out in Illinois and two adjacent states within as many weeks. Their products actually cost more than the prices they could obtain The moderate size concerns just manage to make both ends meet Larger ones, with swaggering gates, and aided by Judges Hook and Crook, make a little more But it is only the largest establishments, whose deals are square, that increase their incomes in any way that is worth while. But it must not be supposed from this that no company can succeed without starting in a big way. The most successful ones commenced in a small way. The small concerns which have gone to the wall did not fail because their capacities were small so much as on account of failure to succeed. Like an individual, a firm or corporation must keep the expenditure below its income in order to succeed. And the smaller the outlays the better, providing facilities keep close step with requirements, and opportunities for expansions are eagerly embraced as quickly as they appear. "'Tis not in mortals to command success"; the utmost they can do is to deserve prosperity. One of the most extensive millionaire business houses in Chicago started by selling cheap watches Providence smiled on the founder, and he rushed forward and upward by leaps and bounds. Recently they installed their own electrotype foundry. As they had plenty of money, it might have been supposed that they would have put up the greatest foundry on earth; but they started with a small plant, and waited for signs of success before enlarging.



"MORNING"

Block by
W C KEENE

Photograph by
R KEENE, LTD

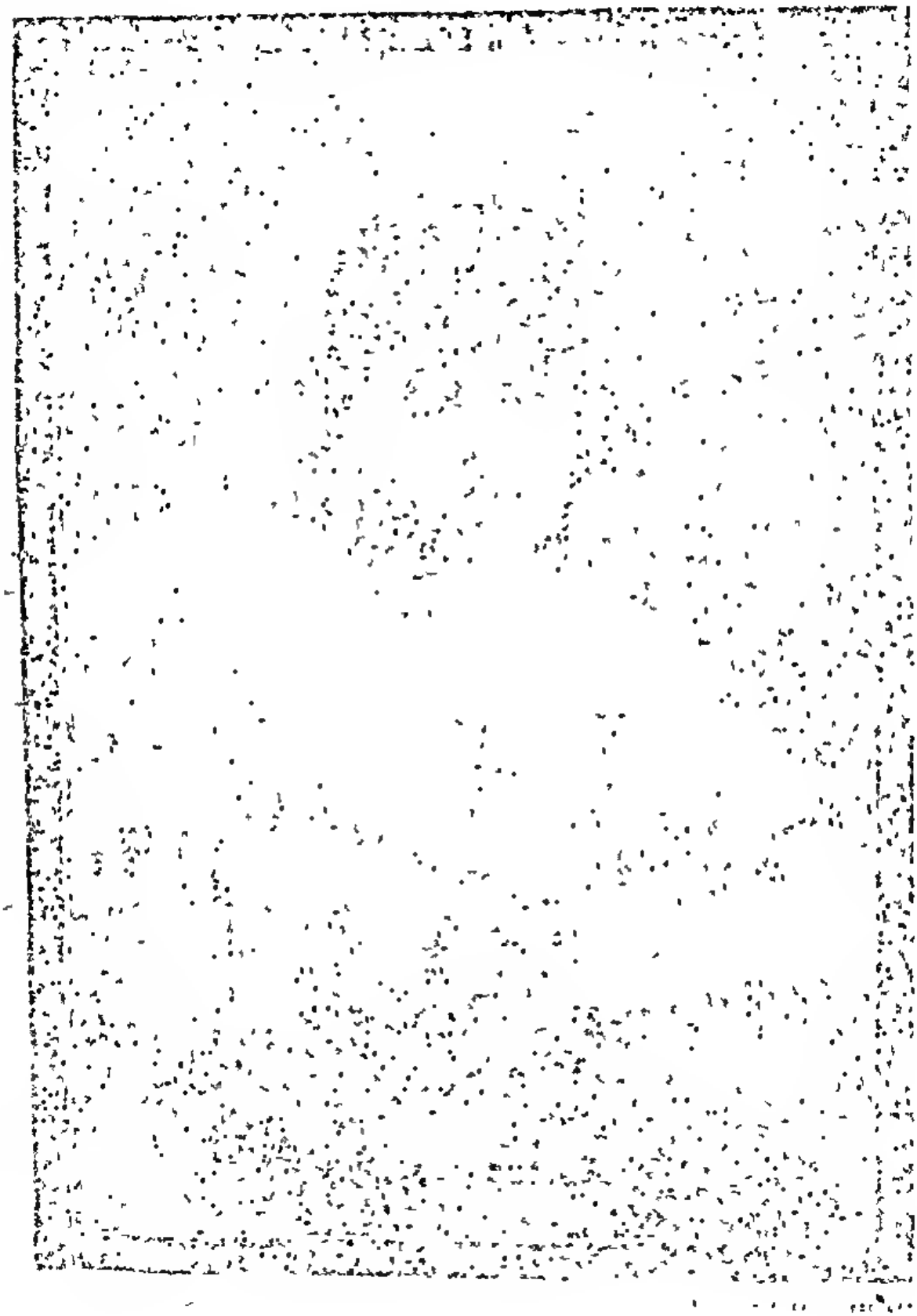
AUTUMN FLOWERS.

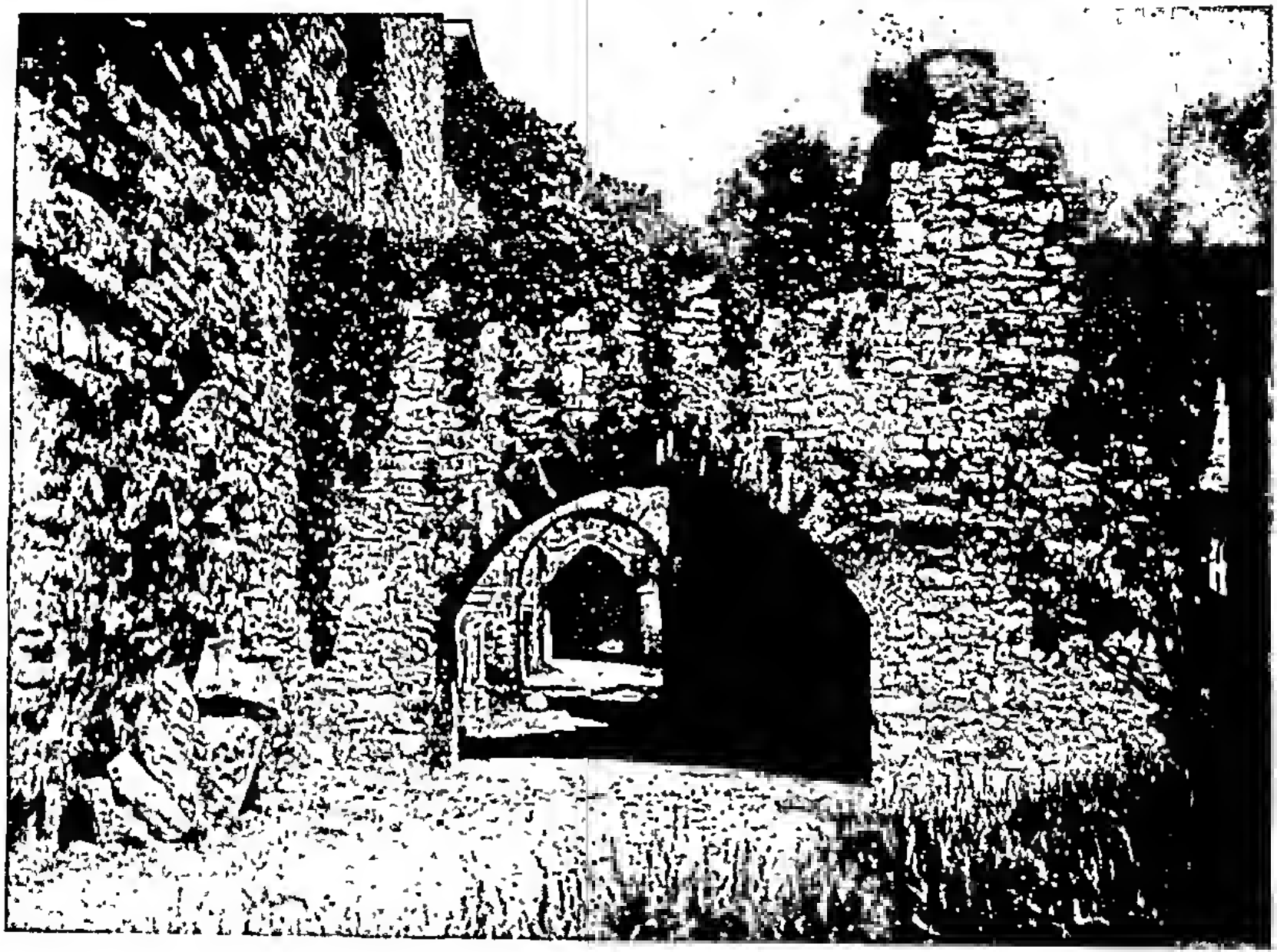
The Electric City Engraving Co.

PHOTOGRAPH BY S. J. BECKETT

THE MIRROR.

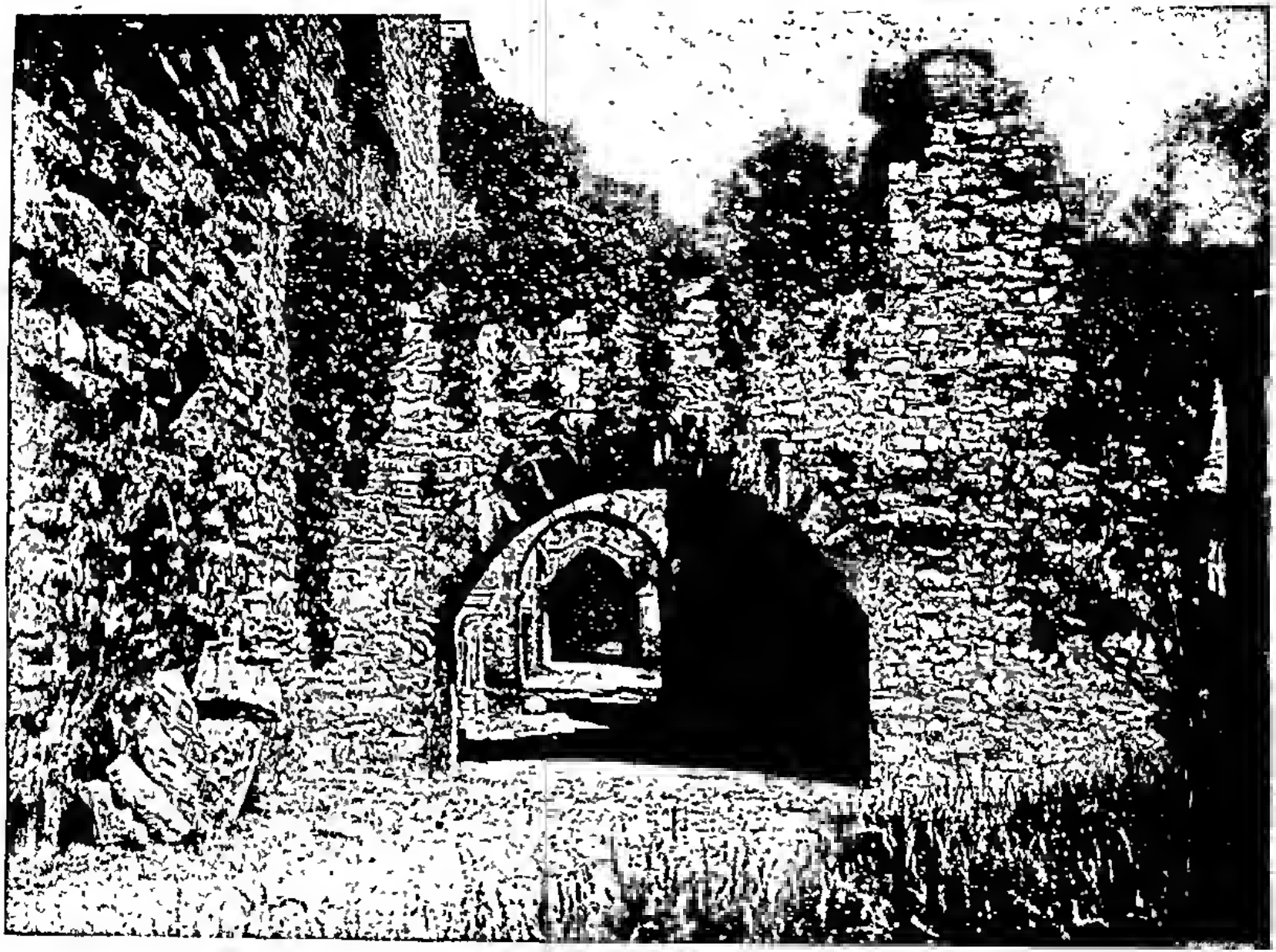
Ashworth & Meredith.





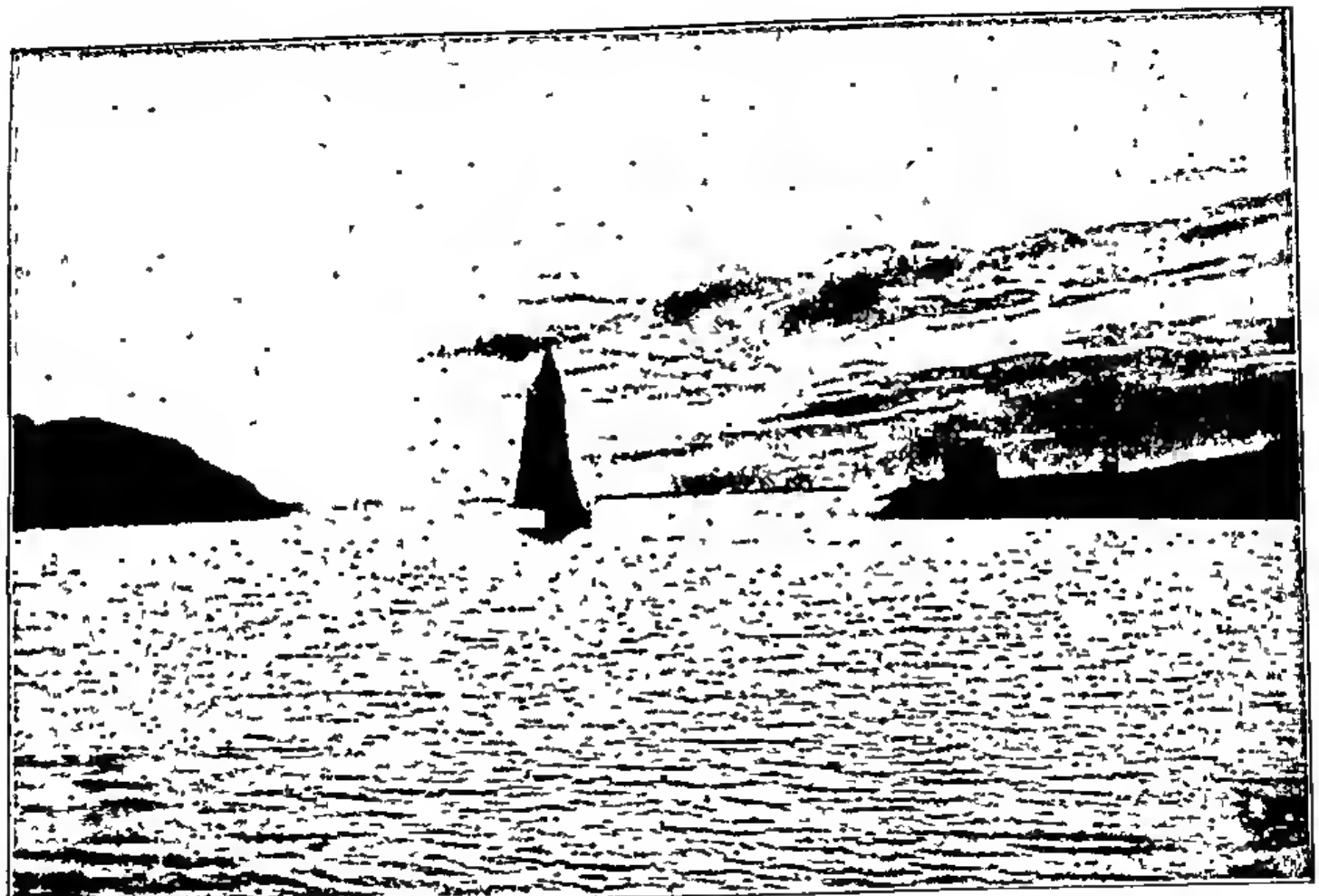
OLD RUINS, BELGIUM.

Metzograph Screen.



OLD RUINS, BELGIUM.

Meetzograph Screen.



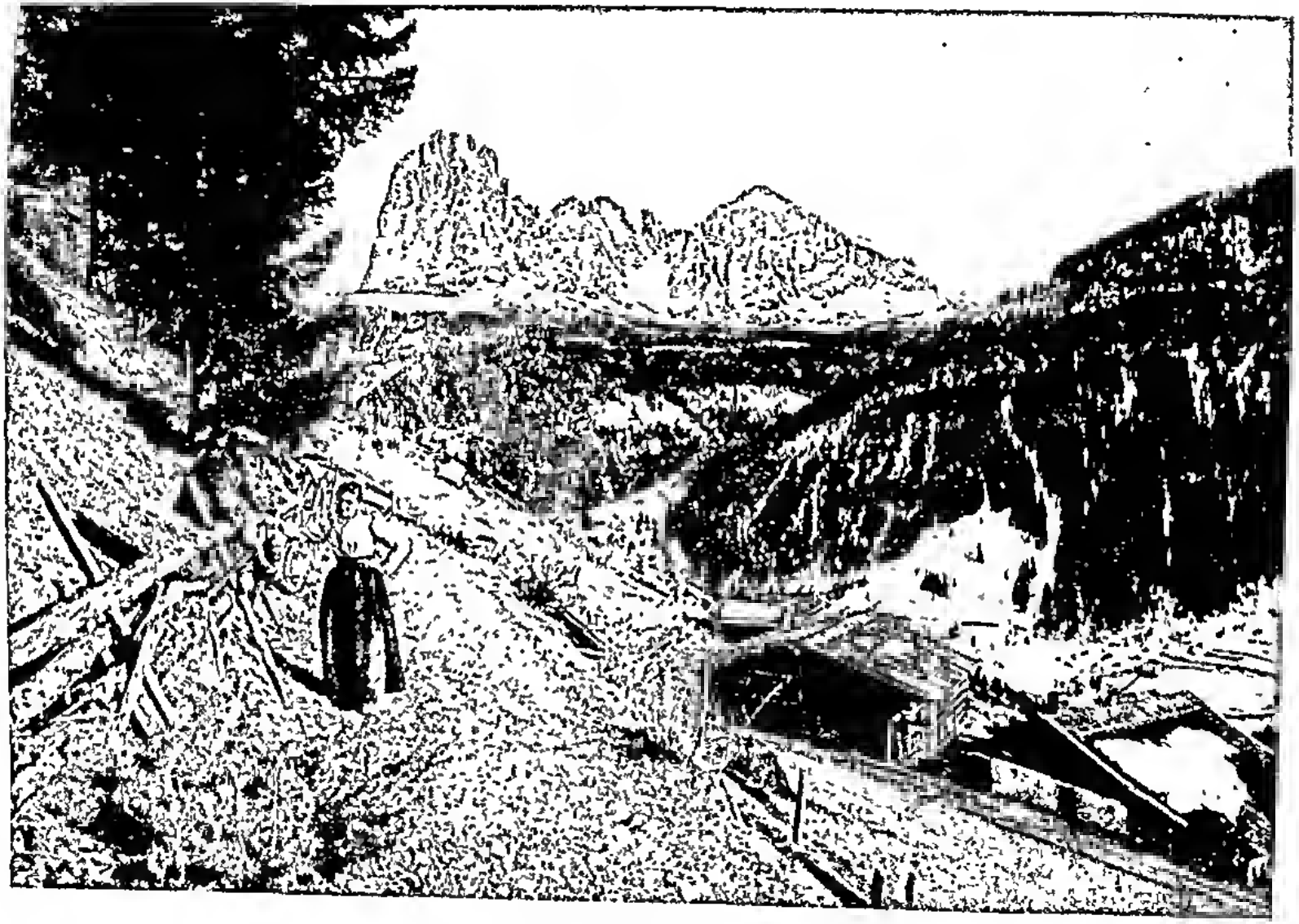
VIEW FROM MARSTRAND, NEAR GOTHENBURG, SWEDEN.

(Half-Tone on Brass)

Wald. Zachrisson.

INKS BY.
AULT WIBORG & C

ENGRAVING CO



PHOTOGRAPH BY EMIL TERSCHAK

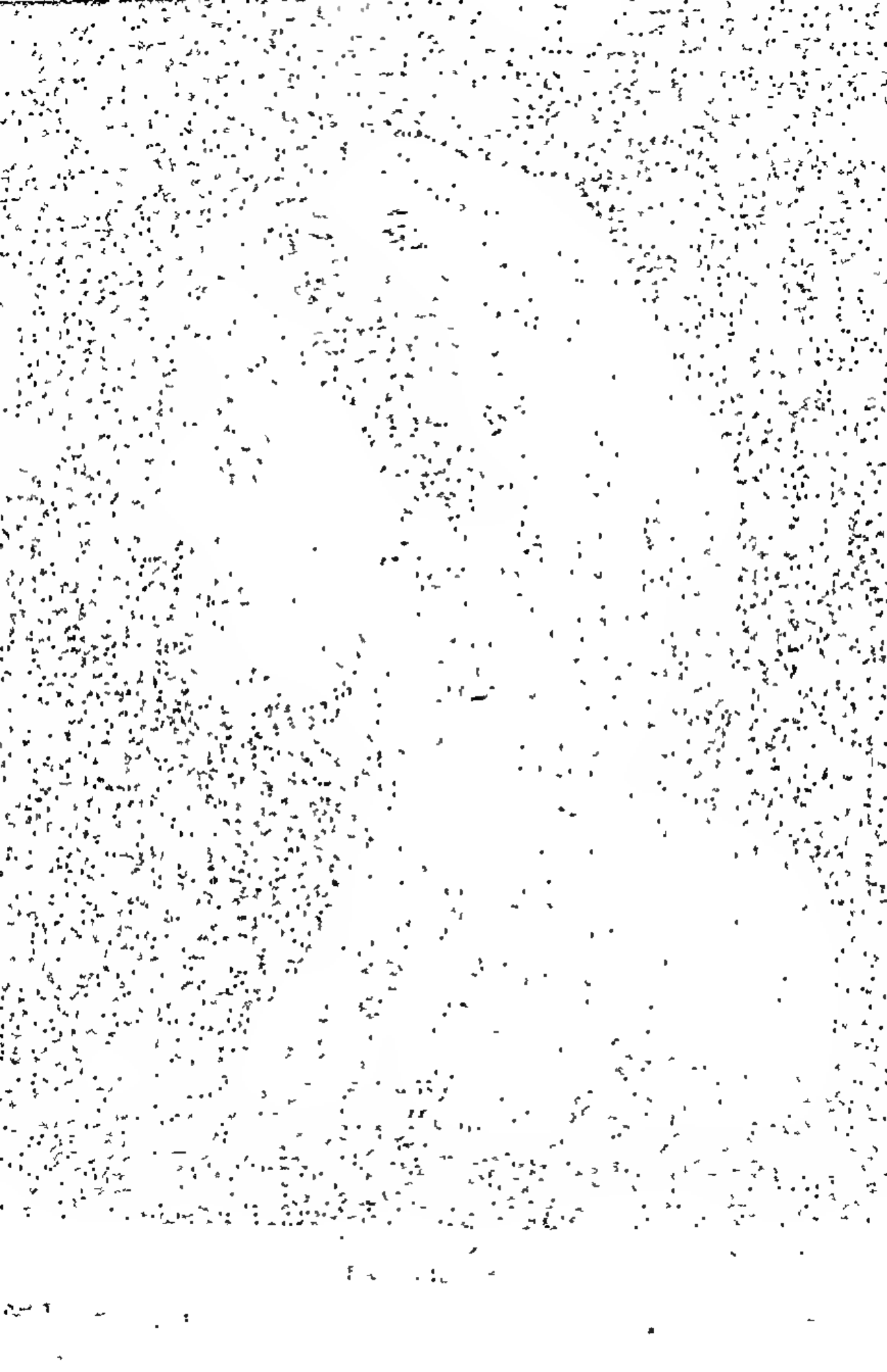
A TYROLEAN VALLEY.

C. Angerer & Goschl.

PHOTOGRAPH BY LANDIER LTD.

DAY DREAMS

Art Reproduction Co., Ltd.



PHOTOGRAPH BY E. O. HOPPE

ADAGIO.

Carl Hentschel, Ltd.

PHOTOS BY J. C. BURROW F.R.P.S.

UNDERGROUND PHOTOGRAPHY.

Tin Miner at Work with Rock Drill and Sprayer.

Deep Down in a Slate Mine, North Wales.

Hewers at Work in a thin Coal Seam, 1800 feet down.

Harrand & Fuller.

[illegible] PHOTOGRAPHY.

[illegible] Miner at W[illegible]
[illegible] Drill and [illegible]

Dress [illegible]wn in a State Min[illegible]
[illegible]orth Wales.

[illegible]

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THE OMNICOLOR:

A New Process of Photography in Colours by the method of Ducos du Hauron and de Bercegol.

By ALCIDE DUCOS DU HAURON,

Author of "La Triplice Photographie en Couleurs."

I. General Description of the Omnicolor Plate and its Properties.

SHADOW AND SUN

Engraved by PRESS ETCHING CO

Photograph by FRED A WILLIAMS

THERE exists between the Omnicolor plate and the ordinary photographic plate a resemblance which consists in this, that both are automatically coated with a gelatine preparation mixed with silver bromide, which is nothing else than a panchromatic emulsion, but it differs from the ordinary plate in this respect, that the emulsion, instead of being spread upon a colourless transparent substance, such as a sheet of glass or untinted celluloid, rests on a sort of ground or mosaic in three colours, from which it is always separated by an impermeable varnish of imperceptible thickness protecting this mosaic. It is on this transparent varnish that the emulsion has been set. The divisions of the translucent ground in question are of such thinness that they are not visible to the naked eye, and seen by daylight they combine into a generally uniform neutral tint which seems white in contrast with the dark tones of the subject reproduced, but examined under the magnifying glass they divide into an immense number of juxtaposed rectangles with an invariable symmetry and characterized respectively by the three fundamental colours of the spectrum, namely, scarlet, green and blue-violet rectangles. If on any portion of the plate one inspects the microscopic rectangles of each of the three colours, it will be seen that any given space taken haphazard contains exactly the same number of rectangles. This plate, triumphantly combatting with the infinitely little, has been given the name of Omnicolor, because point by point the light as it may be said, has the power to bring out all the shades of the colour of the subject to be reproduced, however varied and innumerable they may be.

The mechanism of such a phenomenon is easy to understand by those who have grasped the ideas, nowadays pretty well known, which are connected with the composition of the spectral image according to the latest classification of science. It is no longer a question of the seven colours of the prism, till lately

exclusively adopted by orthodox teaching, but of the three regions of the spectrum which reconstitute—no less than the seven *colours*—as white when they are added together, especially by means of projection on the same screen. It is to be observed that this reconstitution is effected, not only when these three regions emanate from the prism itself, but also and quite well when they are obtained artificially with the aid of tints produced by manufactured products. In the one case as well as in the other the *mixture*, optical and immaterial, of the three tints, scarlet, green, blue-violet, produces black in different proportions, and gives the reproduction of the universality of the colours of nature, whilst all the three added together in their maximum of intensity recompose the white light.

It is sufficient to recall these principles, so that this new physical instrument, now introduced under the *name of* Omnicolor, will be a puzzle to nobody either in the world of society or in the circles of erudition.

Even if there were only superficial notions on that which treats of the path of the rays and on the science of the photographer, the reader has already a presentiment that, contrary to that which is practised for the usual black prints, the *exposure of the* Omnicolor plate is made in the photographic apparatus with the plate reversed, in order that the luminous pencil coming from the object crosses the coloured divisions before reaching the sensitive film. One guesses what happens by the fact of this passage through the plate. On every point of the surface made composite by the above-named divisions and on the sensitive coating, the light radiating from the model is more or less intercepted by the filter of the three colours, and it might also be made so that it would not be intercepted at all. It is, according to the same point, the coloured radiation which meets a tint of the filter approaching more or less to its own, that is to say, more or less mixed with other elements of colour. Whilst on the one hand in the panchromatic coating the absolute interception translates itself by the complete absence of black, the non-interception gives an intense black. Between these two extremes are innumerable degrees in the differential darkening of the silver coating and, therefore, in the weakening of the brightness of one or other of the three elements of the colour which is situated at the same point; every microscopic rectangle taken separately grows more or less feeble, or does not diminish in strength at all, compared with its primitive luminous intensity. From this results an unlimited multiplication of colours and shades which the development will bring out in this clever process which has become the rival of the nature itself.

Let us hasten to acknowledge and proclaim a consequence which could not escape from the deductions of whoever has followed closely the above-presented analysis; we will say by this that the polychrome obtained is a *negative*, supposing, as may be well understood, that the operator employs the usual development, which yields a panchromatic result.

But the image in the present *circumstance* is not solely negative in the usual sense of the word, namely, reversed in the distribution of the lights and shades; it is negative *through* and through, that is to say, it is reversed or anti-chromatic in respect to colour, each of the colours of the model being translated into its complementary colour. Thus, that which is purple-red on the model will be changed to green, that which is green into purple-red, that which is yellow into violet, that which is violet into yellow, that which is blue into orange (which we may equally call a scarlet tint), and that which is orange into blue.

Is there an advantage or an inconvenience in this? All depends on the aim that one has in view. If this aim consists in only a positive example one would like better, no doubt, to obtain it by a single operation, but on the other

hand one would he deprived of the resources for improvement of the result, and of procuring better rendering which, as all practical men know, can be done through the intermediary of a phototype negative in the elaboration of subjects of superior artistic value. Yet, on the other hand, it is to be considered that the Omnicolor negative can be easily converted from a negative and anti-chromatic into positive and verachromatic result with very little trouble or risk.

It can be done by two methods: The one consists in copying the painting furnished by a first plate, on to a second Omnicolor plate identical with the first, and the double reversing will give the desired iconography.

The other method, which till now has given the best results, needs the employment of only one plate, and it opens out a way of producing the counter-values of the image obtained in the first instance. This simply means that the negative image once created is not to be fixed, but, on the contrary, to be effaced by means of the well-known agents for destroying the image; then the surface of the plate is to be exposed to the light to make it capable of a second development. The second development operating on the non-reduced silver bromide will make the desired positive image appear together with the true polychromy of colour.

It will be seen that the Omnicolor plate belongs, by its transparent nature, to the class of vitreous transparencies of diaphanies or stereoscopes, etc., illuminated from behind, and is not multipliable in the same form of an Omnicolor plate, each being a unit, requiring a separate exposure for each copy.

This rarity of production in that which concerns the Omnicolor transparencies is only a partial misfortune, largely compensated by the unlimited power of multiplication of the proof in colour that one may expect to obtain—though not on glass or on transparent films—but on paper if one utilizes the Omnicolor—as we shall show in the latter part of this article—for one or other of the photo-mechanical processes of trichromy which do not proceed by juxtaposition, but by superposition of coloured elements, according to the principles fully recognised to-day and applied so successfully everywhere, and which were discovered forty years ago by the two pioneer inventors, Ducos du Hauron and Charles Cros, each engaged in the same research unknown to the other. By the fact of a similar association the Omnicolor will create the most perfect and most ideal image that has ever been produced, and the photo-mechanical processes in question will multiply to infinity this image for the illustration of books and albums under conditions of success that have never yet been equalled.

The day is not far distant when, without danger of rupture, this fruitful alliance of the two kinds of trichromy will be brought about. But if the Omnicolor had only to be realized in this actual form of a transparency it would have to share the misfortune of the diamond, to be never without a flaw. Yet, may we say that the Omnicolor would not fail, even in its enchanting solitude, to occupy in the world of marvels a foremost place.

It has gained this place at the outset of the game, because its birth dates scarcely a few months back, and incomparable work already attests the mastery of this painter, who excels by serving himself with brushes dipped in the rainbow. To speak in less figurative language, let us say without fear of contradiction that such an artist seems to have been, by signal privilege, licensed to travel through the stages which ordinarily lead from the easy to the difficult. From this beginning it has gone straight to the more difficult, and one cannot sufficiently applaud it for that. It is thus that, putting aside the copying of the vases, trinkets and other subjects of secondary order, it has from the outset confronted with an unheard-of good fortune the reproduction of the human head; and, let

it be well understood, the living head, not the head in painting. It has also essayed the reproduction of landscape from nature, and even conquered the difficulty of a winter landscape shaken by the wind. Each trial, each improvisation has been a triumph for it. There never could be given in any pictorial work made by the hand of man, or in any translation which the light itself undergoes—be it by the interference colours, by pigmentary photography *in three colours*—such coloured representation of nature revealed as by this process, with such vigorous identity between the tints of the model and those of the copy, with such purity of the lines and with such penetrating charm and intimate association of analysis and synthesis, together with the innumerable harmonies which are derived from it; and, for the eye which contemplates such pictures, there is also an intense sensation of reality.

II. Historical Sketch, showing the successive phases through which the invention has passed before manifesting itself in the present form.

In his initial patent taken out in France the 23rd of November, 1868, and in a pamphlet published the following year, "Les Couleurs en Photographie, Solution du Problème" (Paris, Marion, 1869), and later in the book entitled "La Triplice photographique des Couleurs et l'Imprimérie" (Paris, Gauthier-Villars, 1897), Louis Ducos du Hauron has described numerous modes of working his system of photography in colours. All had for a starting point a preliminary operation, the same for each process, consisting of the creation separately and successively of three phototype negatives of the subject, interposing between the model and the three sensitive surfaces three differently coloured mediums, called filters or selection screens, *viz.*, a scarlet screen, a green screen and a violet screen. Once obtained, these three phototypes, uncoloured as all the ordinary phototypes are, but all three dissimilar, by distribution of the lights and shades, and translating by the differences of their prints all the shades of the colours of the object to be reproduced, the end of the operation consisting of printing in blue the image furnished by the scarlet screen, in crimson red the image furnished by the green screen, in yellow the image from the violet screen. The synthesis was obtained by the superposition of the three above-named pigmentary images, yellow, red, blue, either through the printing block or in the form of glasses bearing the tinted films. This manner of proceeding, in some variation which one may adopt, has obtained the name of Trichromy by superposed elements.

But as a consequence of the detailed descriptions of each of the variations in question, Ducos du Hauron, in his memoirs and in the above-named book, has described, summarily it is true, but very exactly, a mode of execution of the system by which he said that the triplicity of work is reconciled with a unity of surface, and where it is no longer by superposition, but by juxtaposition that the law of three colours is manifested.

This mode was no other than the combination described in the opening of this article embodied in the Omnicolor plate, which in consequence is made to pass from the purely intellectual domain to the palpable reality.

In other words, it is no less than forty years ago that Ducos du Hauron proposed to substitute the three pigmentary stages imagined by himself (as well as by Charles Cros in the same year and in the same hour) by a single stage, which need, he said, only consist in a sheet of dioptric paper mechanically covered on one of its surfaces with three kinds of coloured stripes or divisions.

"Let us imagine," he wrote, "that one covers the surface of this paper, on the side where the coloured stripes are imprinted, with a preparation which gives

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directly under the influence of the light a positive proof, and that one receives on its reverse side, namely, on the side not covered with stripes, the image of the camera: it will happen that the *three single colours* (such was the expression employed at this epoch, and which the progress of science led to the abandonment in our day, of all the colours of the spectrum, an immense number) will filter through the paper and form each its positive print; that is to say, its print in light on the corresponding ray of colour, and the three prints will be formed with the same rapidity, in spite of the unequal degrees of actinism of the three simple colours, if one has been careful to give to each of these three sorts of stripes a relative translucency inversely as the photogenic power of these same colours on the preparation employed."

Evidently the original idea of the Omoicolor plate, namely, the combination in virtue of which the radiations given out by the subject only reach the sensitive coating after having been filtered by the trichrome screen which serves as support to the said sensitive coating, was entirely founded on the enunciation which has now been transcribed.

The only difference which exists between this conception of forty years ago and its actual execution, is that the panchromatic coating with gelatino-bromide gives a *negative* image, while the passage we now cited aims at a *positive* image. The principle is the same and the difference is only the question of the date.

In 1868 there was still nothing to enable one to foresee the advancement of gelatino-bromide—this king of speed in photography. But to give more clearness to the summarized explanations concerning the operations and a purview in which he indicated what was the state of project under the reserve of regulating the particular problems of execution in proportion to the execution itself, Ducos du Hauron judged it in the meantime convenient to establish his deductions according to an example, and it is thus he supposed the case of a positive image. It is to this hypothesis that his demonstration has been adapted. In the ignorance he was in concerning the considerable rôle that gelatino-bromide would have to play one day, nothing seemed to him to modify the adoption of the inverse hypothesis—that of an initial negative. Admitting that it would have been here a gap it has been amply repaired by him in his later publications, especially in the *Communication* he addressed from Algiers in 1891 to the Académie des Sciences, under the title "Reproduction photomécaniques des Couleurs" (Algérie, Vve Bonyer et fils), and in 1897 in the above-mentioned book "La Triplice photographique des Couleurs." This book shows in treating of trichromy by juxtaposed elements, the reasons which make one prefer to the ternary *purple-red, yellow, blue*, the ternary *orange*, green-violet, which gives an image in the same time negative and antichromatic, susceptible of being rapidly transformed and at the same forming an image true in colour and true in distribution of the lights and shades. *The trichromy by juxtaposed elements*, as it had been conceived and formulated by Ducos du Hauron, did not share the fate of those inventions, sometimes very meritorious, which wait for a very long time for recognition. This one did not suffer a similar mortification. It attracted betimes the sympathetic attention, if not of the public authorities, at least of a multitude of persons of artistic vocation, willing to engage themselves amongst the volunteers of photography, never under its black standard, having for that only an aversion, but under its banner of resplendent colours. Their sympathetic support of the new processes announced by Ducos du Hauron was easily explained. The one plate was substituted for the three plates at first proposed, a single exposure to the light substituted for three successive exposures, an ordinary manipulation with the silver salts substituted for the complicated operations which at that

time were hardly practical, requiring the different modes of photochromography by superposed elements. In a word, it was *colour for all* instead of the *colour for a limited number*, such an enlarging of the programme being made in order to popularize the idea.

Unfortunately the industrial concurrence which was necessary to the inventor to put the system forward failed him.

They failed him for the peremptory reason that if theoretically the photography in colours had been brought within the reach of everybody, nevertheless during numerous years which have elapsed no industrial house undertook to construct the marvellous instrument, the sensational diapositive which was to popularize it in this way. It was, it is just to recognise, a great question of manufacturing and industrial art, well calculated to intimidate even the most enterprising manufacturers. One is pleased to attribute to the inventor a great fund of patience and some manual ability, but he was exposed to the discredit of his work, if, in the absence of perfect tools and of the aid of the modern mechanic, which were almost indispensable to the creation of this diapositive, he was obliged to create it himself for demonstration, the objection having been made to him that he had demonstrated nothing. As to the professionals of the industry, one could not, I repeat, blame them for being afraid. In consequence of the insufficiency of the means of realization which existed forty years ago and even for a long time afterwards, it is certain that the first application of the invention ran the risk of never returning, or at any rate for a very long time, the large advances which had been consumed by the enterprise. The hesitation of a principal of an industrial house was still more permissible, as science had no resources and remained for a long time without remedy for the desperate slowness of the first sensitive coatings for orange and green light. This slowness was so extreme that it rendered impossible the reproduction of a number of coloured subjects, both natural and artificial, requiring too long exposures. Ducos du Hauron had to resign and to adjourn to more favourable times the continuation of this part of his work.

Until the year 1895 no tentative result had been produced in the photographic world, at least no notable trichromatic proof by juxtaposed elements.

But at this date a distinguished physicist, Professor Joly, Dublin, presented to the scientific societies a polychrome which corresponded in its mode of formation with the principles of the trichromatic mosaic and of the silver coating, combining one with the other. The screen was formed (in what way it is indifferent for the reasoning and for the results to specify) not with geometrical figures, with rectangles for instance, but with contiguous stripes. This work, executed with the aid of the most primitive appliances, failed to be demonstrative by its imperfection. It was simply saluted and celebrated as an event.

In a more recent epoch Mr. Brasseur, of New York, proceeding according to the same principles, was able to compress so closely the lines of the screen that he could introduce up to twenty-one lines in a millimetre, and from this process, a marvel of care and patience, resulted the nice results which were justly applauded. The only mistake (supposing it to be one, which is not certain, and is in fact opposed to the claims of Mr. Brasseur) was in the extreme smallness of the dimensions of the striped ruling, necessitating a very great expense in time and money, which was hardly favourable to the generalization of the process.

Finally, during the last few years, Messrs. Lumière, of Lyons, have inaugurated in their famous works at Monplaisir, under the name of *Autochromes*, a product—let us hasten to tell it—marvellous and grand from this photographic palette of the three colours, whereon all the colours of the creation are contained.

One may imagine a sheet of glass mechanically powdered with three kinds of dust, orange, green and violet, the grain being held by a transparent agglutinous surface, and not accumulating anywhere, but forming a microscopic three-colour pavement, so to speak, which one would find to be sensibly uniform all over if one square millimetre were compared with any other forming the surface made up of such a large number of them. These grains all touch without resolving into continuity. All this is really very astonishing. But the admiration becomes still more excited when one learns that this three-fold dust is made with myriads and myriads of regular globules and of same size which Messrs. Lumière have discovered the means of extracting from the flour of potatoes, and of making them imbibe, without darkening them, the richest tints of the prism. The pictorial work furnished by this improvised palette is absolutely truthful and full of beauty. Let us highly proclaim that these innovators to whom one owes many similar wonders are men of genius.

In order to take up again where we left it the history of the Omnicolor, it remains only to note the fortunate phases and the favourable events which justify finally a hope constantly frustrated during the last forty years.

If he had to suffer so long a forced inaction Ducos du Hauron, considered as the one who had applied a conception which was well his own, did not put himself forward as a front-rank man, the authentic predecessor of whomsoever, in order to photograph in colour, had refuge in the trichromic screen, linear, paved or granulated, covered with a sensitive coating, which becomes black in the light. One could not be ignorant of the irony of his fate as inventor and one might deplore his isolation. Was it not the case to say: "Misfortune comes to him who is alone?"

"But since the summer of 1905 this has ceased to be. Returning to France, after a long stay in Algiers, he finds again his nephew, Raymond de Bercegol, whom circumstances had separated from him for nearly twenty years. There was a conversation between the two, the effect of which was to change by degrees the face of the things in regard to this process.

This conversation treated on the invention in question. Numerous persons, it is to be said, had considered it to be absolutely dead, that is to say, as not susceptible of an industrial realization. "That which was impossible in 1868," said the nephew to his uncle, "is much less so in 1905? The auxiliary arts have progressed and the means to attain such an aim as yours are more numerous and better, yet it must also be acknowledged that the claims of the public are larger. If, in the first place, not to speak only of monochrome photography, one had to return to collodion, there would be no more photographers, so little is the operator accustomed to the troublesome routine which was accepted formerly, and such a one is accustomed to become an autocrat in his work, letting the manufacturer remove all trouble other than of setting up the apparatus in front of the model, of estimating the duration of the exposure, and of developing the plate. In consequence of this, if one makes photographs to-day, and if all over all the globe they are produced in such formidable numbers, it is especially to the manufacturer that one has to attribute the merit and the glory. The conclusion of all this is, if you will imitate that which one has accomplished for the monochrome photography, and bring it into vogue for colour, it will no longer be, as it was in 1868, a matter of creating a few specimens, admirable but costly, but of making them admirable and cheap. Never mind if the appliances, the installation, the staff, the research represent enormous expenditure, if it is possible to produce rapidly, easily and in immense quantities at popular prices, so that you can supply to people of moderate means as well as to the more fortunate

ones, the new panchromatic plate in which your latest tri-colour will be incorporated."

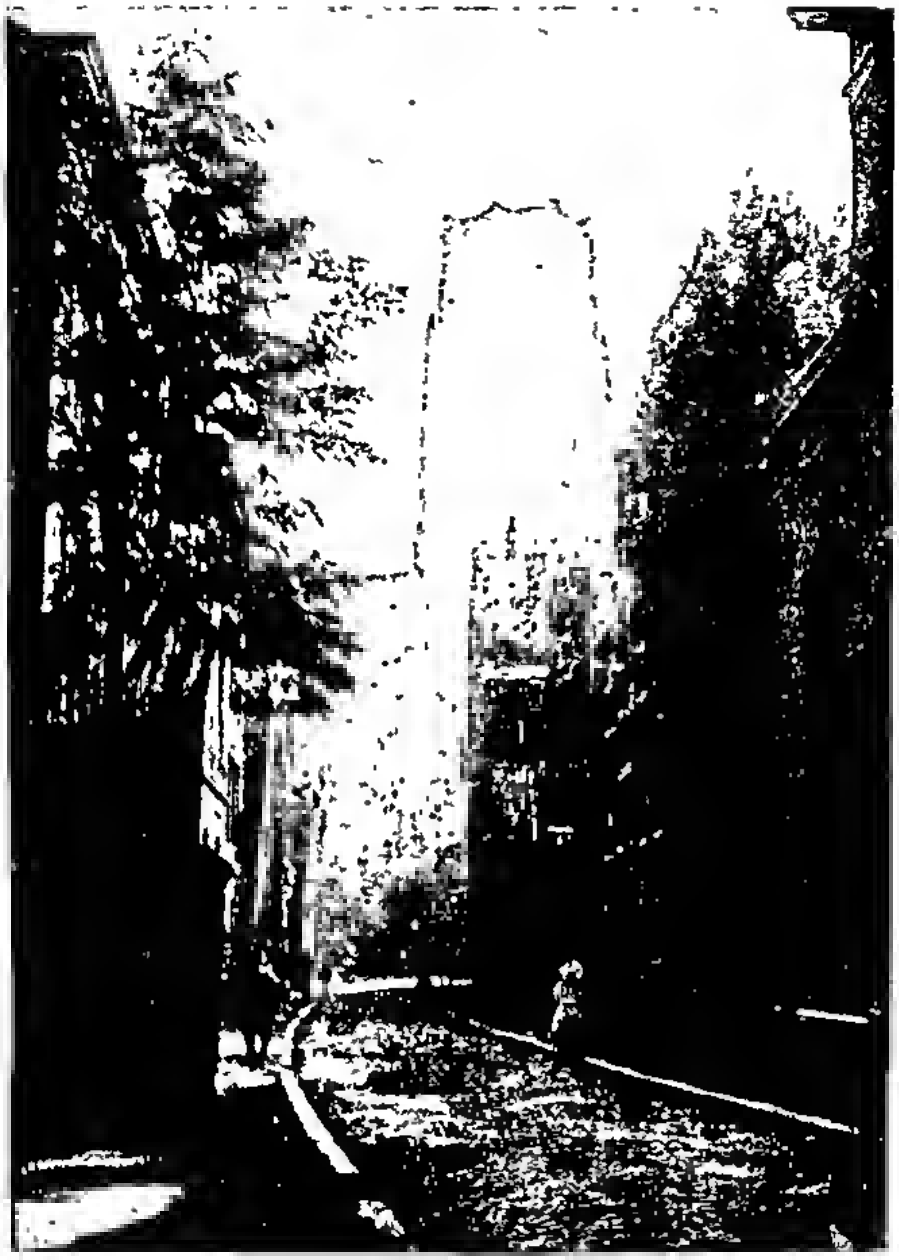
Expressing himself in this way, M. R. de Bercegol gave advice absolutely conforming with the intimate conviction of his uncle. There had been the same intuitive work going on in both their minds before it was realized, distant as they were one from the other for so long a time—a reciprocal communication of their ideas. Charmed one by the other with this second relationship which had revealed to them a similar communication, they decided to unfalteringly work together in collaboration the problem of putting into practice the process as it had been conceived by their common inspiration, and not to let it drop whatever might happen before resolving it into its utmost detail.

This plan, however, was only realizable on the condition that the manager of some good industrial concern, provided with the necessary appliances, would partake of their hopes and would kindly lend his valuable co-operation to their work. Would they find a man of exceptional competence and clear-sightedness disposed to furnish them with his help? They found him in M. Joseph Jougla, founder of a prosperous photographic works at Joinville. An uninterrupted and stubborn labour, which has consumed days and nights for many months past, has finally put the two investigators in possession of all the elements of manufacture, without ceasing to study every new means for the improvement of the plate, which has been named the Omnicolor.

It was on the 6th of February, 1906, that the official date of this complicated discovery was reported. On this day a patent was taken by them in France, soon followed by certificates of acceptance and accompanied by the taking out of patents in other countries.

The plan of the present notice, which is addressed rather less to the specialist few than to the generality of the artistic world, does not allow of a detailed analysis of these documents. It is sufficient for us to reveal that which seems to us to be the culminating point, the most characteristic side, leaving to the engineers and technologists the care of drawing deeper ideas from the original texts.

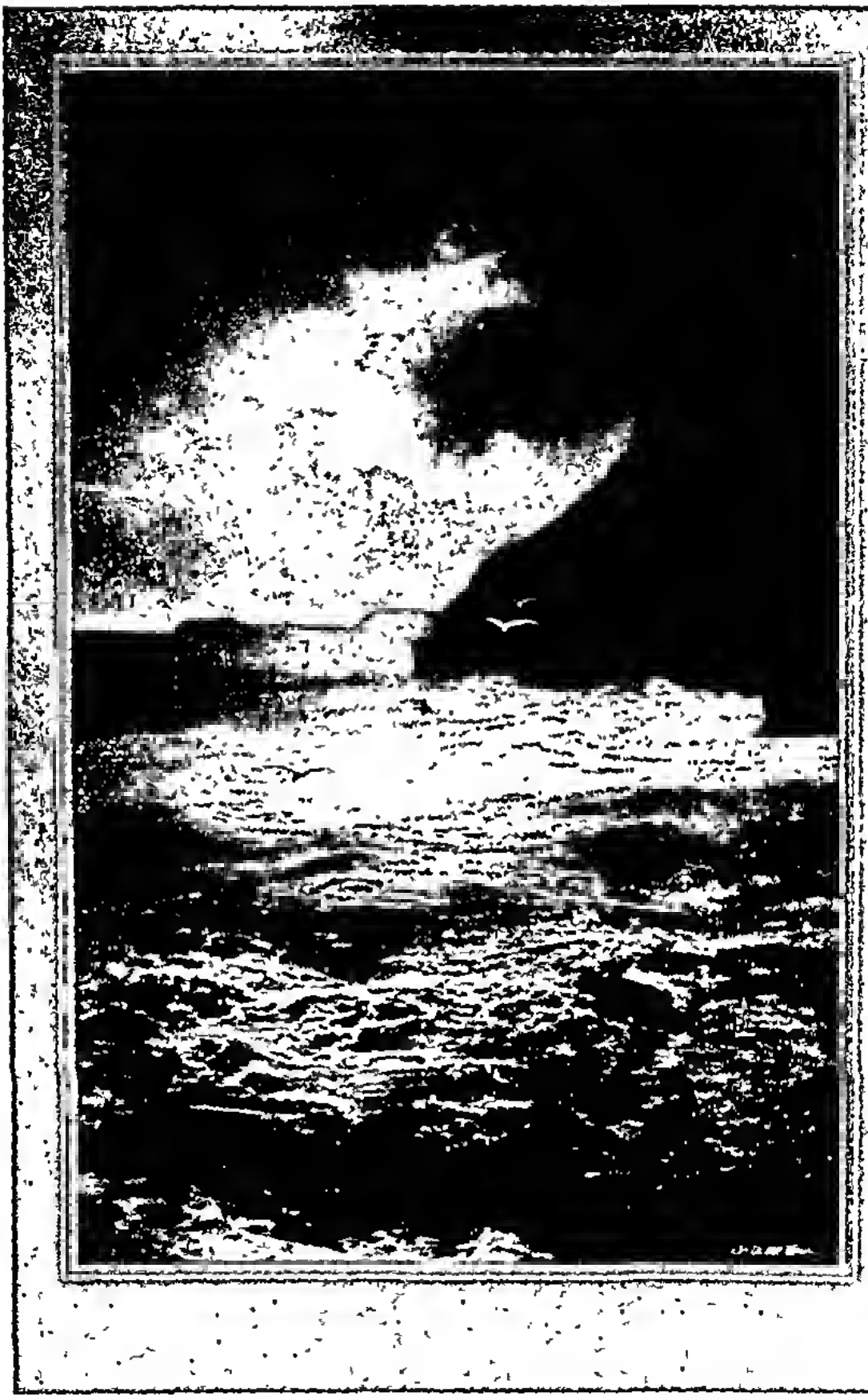
With the aid of rapid mechanical appliances, served with greasy inks, are printed on gelatined glass plates—being a transparent substance with invariable dimensions—two lines of different colours crossing each other at a right angle. In the actual case one has to understand by the term lines a considerable number of very small rectilineal stripes parallel to each other, separated by an interval equal or nearly equal to their thickness. Special engravers can give to these rulings, through their almost microscopic fineness, an absolute regularity and, on the other hand, the mechanism of the impression roller assures the perfect homogeneity of the inking from one end to the other of each stripe. The crossing at right angles of which we have spoken, needs no care in registration, because even if the crossing should be a little oblique, the screen would not suffer from it, because, as may well be understood, the angle would be the same over the whole exteht of the plate, a result guaranteed beforehand by the perfect regularity of each of the two rulings. As for the small rectangles, which are intercalated between the rulings, how are they to be provided in their turn with the colour they have to represent? By an operation very different from that which has created on the plate the two first colours. It is none other than an automatic moistening, the effect of which is that this third colour, which is a water-colour, settles solely on all places not covered by the greasy ink, which repels the water-colour on all places where it exists by the antipathy of the water for the grease. At the points where, in the first experiments, the two greasy ink rulings cover each other by the fact of their crossing, a method of manufacture has finally



PHOTOGRAPH BY G. E. MOGLE

A STREET IN HOLLAND.

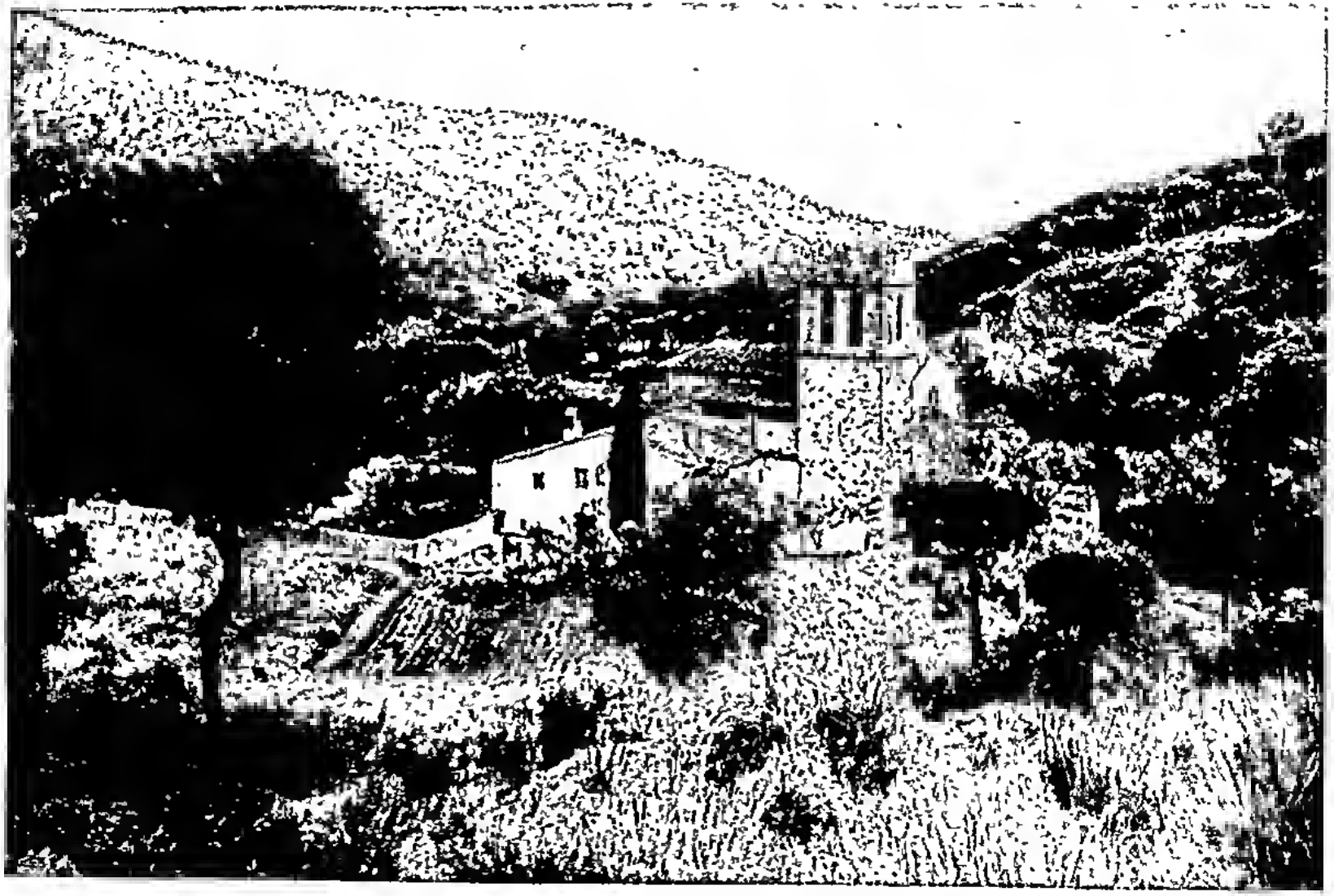
"Helios"



PHOTOGRAPH BY R. R. TYRE

"Where haunts the bittern and where screams the mew."—*Savage.*

Arthur Cox Illustrating Co., Ltd.



VALLVIDRERA CHURCH (NEAR BARCELONA).

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avoided this covering, which only made a slight diminution in the clearness of the trichromatic screen. Once the third colour has filled up in that way all the spaces left bare between the geometrical figures formed to the number of several hundreds, in the space of a square millimetre by the two first colours, the screen offers no longer the least resolution of continuity. It remains only to cover the screen with a transparent impermeable varnish and finally with the panchromatic emulsion.

A product so eminently industrial puts the photography of colours within the reacb of everybody, because the operations of the laboratory are reduced to the current manipulations of ordinary photography.

How can the invention do otherwise than rapidly become popular? If an Omnicolor plate, considered separately, can by reason of the immense number and of the superior co-ordination of its coloured elements, sustain the comparison that one is led to establish between this microcosm and the whole vast universe, the industrial wonder which authorizes a similar drawing is equalled if not exceeded by a second wonder—we refer to the capability of multiplication without limit, which is possessed by this microcosm. The nature of its fabrication is such that in less than a week it can increase as in the spring the leaves of the trees burst forth, without the mould of the microcosm, any more than that of the leaves being ever used up.

III. Epilogue. Forecast of the fate of various modes of Photographic Printing in three colours: the Omnicolor opens up for them an unexpected and magnificent horizon.

It is not necessary to have in a high degree the gift of prophecy to forecast, without fear of contradiction by events, the fortunate and rapid reverberation of the triumph of *photography in colours by juxtaposed elements* over the fate of its elder sister, *photography in colours by superposed elements*.

Since its first essays, the Omnicolor has shown pictorial work of which perhaps nothing analogous has existed, either in the most enchanting of the pictures due to the hand of man, or in the fac-similes that light itself would give of the colour phenomena of the terrestrial world.

As in the musical page, where the song and accompaniment are united by a bond, which cannot be broken, the whole is nothing else than the charm and subject of admiration in each of its initial pictures, starting from the minor details to the powerful effects of harmony.

The impression that one gained was intense and irresistible; everyone fancied himself in presence of nature itself.

The younger sister has displayed already a freedom superior to that which the elder sister had obtained by the studies of forty years.

"Here is a débutante who will kill all the old ones," said, with a low voice, one of the privileged, gathered at the private view at which I was present when the earliest specimens of Omnicolor were exhibited.

"You are very much mistaken; far from killing the old ones, it brings to them an incomparable cordial, an elixir of long life, which will for a long time be without a rival." Such was the answer that another of my neighbours gave.

I understood very quickly the meaning of this short dialogue. It was adapted to the new situation which the unexpected arrival of the Omnicolor created for the various methods of trichromatic printing, founded as they have been a very long time ago by Ducos du Hauron himself, the first to describe them and one of the inventors of the Omnicolor plate, and also by Charles Cros, who, however,

has remained outside that which concerns the Ommicolor plate, but who co-inventor of the various methods in question. All have for a basis, as every knows, the isolated production, and then the superposition of the three pigment transparent images, yellow, blue, crimson, which are transformed optic into a single picture. One cannot ignore those processes which for a long t were unrecognised and retarded in their progress by the insufficiency of means of execution essayed at that time; most of these methods finally bec classic and flourish to-day in Europe and in America in numerous stu for half-tone work, photogravure and collotype, and so-called carbon prints well as those done with stained gelatine films.

Most certainly, in the short dialogue we have related, the first interloc was wrong and the second was right.

It is easy to judge so from the few processes that one is acquainted v that have passed into practice in such and such studio for half-tone work, wl has devoted its presses to three-colour.

Indeed, on the one hand the half-tone, whether printed in colour or in bl is admirable by its almost infinite power of multiplication. An edition of thousand or fifty thousand copies is only child's play for it. But on the o hand, if one considers not only the number, but the quality, of the proofs, if one comes to the question of art, it may be said that the half-tone in t colours, through the apparent universality of its aptitude for succee indifferently with all kinds of painting known, is very richly endowed for one and less so for the others.

It is excellent for copying an *immobile, inimitable thing without reflectio reverberation of any sort*, such as a water-colour well sketched, put in a good pl and uniformly lighted during the whole duration of the three consecu exposures, which are needed for the formation of the three negatives taken thro the three-colour filters, orange, green and violet; but on the contrary, it shown till to-day a certain inferiority, when it was the question of chan to views and the coloured objects, the choice of which would answer more to desire of the great majority of the public. We may speak of portraits and landscape paintings after nature. It does all that is possible to avoid t subjects as one can assure oneself by a comparative review of tricbrom illustrations, otherwise very attractive, published by the leading firms.

The reason for this systematic exclusion is very simple. Different fro water-colour, where nothing moves and nothing changes, here there is perpe movement and continued variation amongst the objects, sometimes in appear the most immobile, which do not belong to the world which reposes under cases of the museums, but to the natural world. There is, for instance, the hu head when it is posed before the photographic apparatus, and it is also the with a beautiful summer landscape during the calm which precedes a st One would think them in complete rest, whilst in reality this head and this l scape move ceaselessly, not sufficiently to particularly change the single in created in monochrome photography, but in a sufficiently marked way to re impossible the rigorous linear identity of the trio of phototypes destined to f the trichromic impression. It should be noted that the oscillation of w I speak is generally accompanied by a continuing movement of translation f the right to the left or from the left to the right. One person oscillates towards right, another towards the left; no one at three different instants, and how slight an interval it may be between all the three, it does not occupy exactly same place in the space, and no one forms in the same resumptions of posi absolutely the same silhouette.

The lines, the wrinkles, and the divisions nf a face, which the life animates, photographed in three times, are also non-superposable when the contour is distorted. What will, alas! he the synthesis of the three images? Too often it is discord of lines and tonalities which a skilful engraver may reduce by retouching with a great super-addition of work, but which would not permit of lifting from the work, however much one may correct it, all the artistic quality.

If this misfortune were the only one! Bnt there are many more lamentable; they are the more unfortunate hecause when they appear one has not the power of remedying them, the three engraved plates which have cost a large amount of time and money being lost for ever. Such is the case for instance, where, unknown to the photographer and the person phntographed, the eye of the latter has moved, so little it may be, during nne or two nf the three exposures; and to his great consternation the trichromic printer sees in such a case created under the forehead, not the eye, that sun of the human face, hut a fleshy excrescence which has no name in any language, a kind of warty aureole of absurd coloration.

The Omnicolor plate comes to put a good order on all this. One will soon learn of it all over the world.

According to the law of the simultaneity of its three impressions it works always with certainty, and one never experiences any of those surprises which have desolated so many times the classic studio of three colours.

From this time the fate of the trichromatic printer will be as happily and as profoundly modified by an alliance, which will become inevitable, with the Omnicolor. Without leaving his laboratory, very peaceful to his days, to his hours, he has only to take with the three selected screens, which are familiar to him, the three negatives of the work created by them and to print them without fear, just as if he were dealing with a docile water-colour. The marvels which the original contains will pass into the reproduction, which he will know to make into an unlimited number of copies.

A Scene on the Wye

Engraved by
Chappelow & Co

From an original Drawing by
Rev. Wm Gilpin (circa 1765)

THE APPLICATION OF BROMIDE OF SILVER IN PRINTING-OUT PROCESSES.

By Prof. E. VALENTA (Vienna).

(Translated by Henry O Klein)

FLOWING TRESSES

Engraved by PHOTOCHROME CO

Photograph by W GILL

DURING my experimental work in study the influence of the presence of brom of silver in chloro-citrate collodion em sions, I discovered that printing-o emulsions which are perfectly chlor free, but contain a small quantity bromide of silver in addition to cit acid and silver nitrate, may be u for printing-out purposes and give, under cert conditions, good printing and easy toning pap To ensure priority I have made communicat of this fact to the 5th Chemical Congress Rome, April, 1906 *

Since then I have made a series of furt experiments which give additional proof of usefulness of the application of bromide chloride of silver in printing-out processes.

The object of these experiments has b to study the influence of various bromides, also of certain salts of metals (chroma uranium compounds, etc.), on bromo-citr emulsions, and also to find the best proport of silver nitrate, citric acid and brom-salts for the preparation of emulsions.

The best proportion of bromide silver salt I found to be 1 Br.: 5-6 Ag.

Whereas in chloro-citrate emulsions the introduction of a part of the sil salt in the form of ammonio-silver nitrate has proved to be highly success especially if the printing paper is to be used for combined gold and platin toning, this is not the case in bromo-citrate emulsions. Also the citric a added to such emulsion does not influence them in the same degree as is the c with chloro-citrate emulsions. The most satisfactory proportion has been t of equal quantities of silver nitrate and citric acid.

Moreover, the influence of the metal to which the bromide is bound dur the preparation of the emulsion is very considerable. The most suitable found to be calcium, strontium and lithium bromide, also brom-salts of all th metals of which chlor-salts are usually employed for the preparation of chlo citrate emulsions besides uranium bromide.

A large number of bromides of other metals soluble in alcohol, such magnesium, cadmium, etc., have given flat images; but a few bromides, as, instance, bromide of mercury, gave very insensitive, useless emulsions.

* *Vide* "Photographische Korrespondenz," 1906, page 283.

PHOTOGRAPH BY ADOLPH LANGFIER

HEAD STUDY.

The Photochrom Co., Ltd.

Emulsions prepared with bromide of calcium print more or less bright red, those made with bromide of strontium dirty violet. Toned with the usual gold toning and toning and fixing bath they give purple brown to violet-black tints in a short time.

A recipe for a very satisfactory bromo-citrate emulsion is the following:—

Collodion, 2½ to 3 per cent.	500 ccm.	A
Citric Acid	10 grs.	B
dissolved in		
Alcohol	40 ccm.	
and adding		
Strontium bromide solution (40 per cent.)	4 ccm.	
and		
Glycerine—Alcohol (1 : 1)	4 ccm.	
Silver nitrate	10 grs.	C
dissolved in smallest quantity of hot water, adding		
Alcohol	40 ccm.	
Ether	80 ccm.	D

A and B are mixed in daylight, C is added in the dark-room in yellow light in small quantities. The solution is well shaken, and finally D is added. The yellowish, creamy emulsion is kept standing for a few minutes and filtered through cotton wool. The emulsion gives permanently good printing papers, the sensitiveness of which is three times as great as that of most collodion papers of commerce. Prints made of these papers can be readily toned in the usual gold and fixing baths, but I recommend the thiocarbamid toning bath*. The pictures lose very little in the toning (3 to 4 per cent. on Vogel's photometer), show no tendency to bronze in the shadows, give a greater range of gradation than albumen paper, but require strong contrasty negatives.

Moreover, by exchanging the bromide of strontium in the above formula with bromide of uranium we get emulsions which are more suitable for soft negatives, and which show similar range of gradation to albumen paper. The sensitiveness of this paper is equal to that of good celloidin paper.

The addition of alcoholic solution of chrom-salts to the bromo-citrate emulsion greatly shortens the gradation, but the sensitiveness of such bromo-citrate paper is considerable, greater than that of the chloro-citrate emulsion with the same addition of chromic acid. It is, therefore, possible to produce a brilliant printing paper for very flat negatives and still retain greater sensitiveness than it would be possible with chromic acid containing chloro-citrate emulsions. Emulsion suitable for the making of such paper can be prepared by adding a solution of 0.8 gr. of bromide of calcium to the above bromo-citrate emulsion. The paper prepared with this emulsion is half as sensitive as celloidin paper, and gives very contrasty prints. Whereas bromo-citrate paper free from chromic acid will give a gradation of over 20, this paper will only give 8-9 gradations. The picture does not go back a great deal in the toning fixing bath, and the excessive over-printing which chromo-chloro-citrate paper requires is not requisite. Papers coated with chromic acid containing bromo-citrate emulsions give beautiful tones in the platinum toning bath, and are very suitable for the production of matt surface papers for platinum or combined gold-platinum toning. In this case considerable over-printing is necessary, because the prints have to be immersed

* "Photographische Korrespondenz," 1903, p. 630.

before the toning in chloride of sodium solutions, and lose considerably in the acid platinum baths.*

An emulsion prepared according to above instructions, and containing 1 6 gr. water-free bromide of strontium† and 0.4—0.5 gr chloride of calcium, gave good printing papers, showing pure whites and strong shadows, free from bronzing and with a gradation similar to albumen paper, together with a sensitiveness three times as great as that of the celloidin papers on the market. The pictures tone well in the usual toning baths and lose very little in the fixing. A harder printing paper can be made by substituting for the chloride of calcium equivalent quantities of chloride of uranyl. We obtain in this way emulsions of better sensitiveness than celloidin paper, of great brilliancy, partly suitable for making prints from flat negatives.

The addition of chromate of calcium will, of course, give us a paper for the flattest negatives, but as the sensitiveness of such papers is lower than that of bromo-citrate papers, containing chromic acid, these latter papers are to be preferred for the purpose.

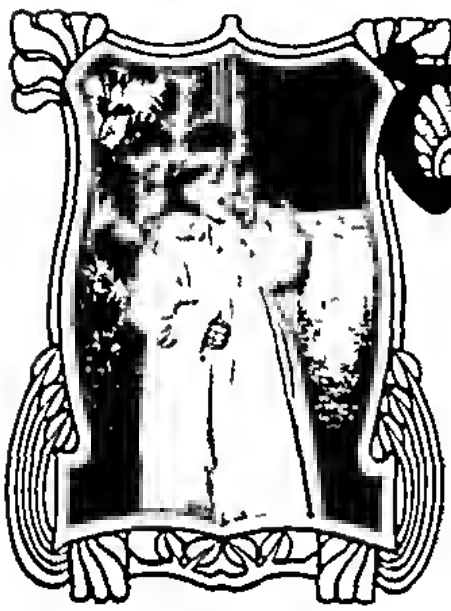
* *Vide* Eder's "Recepte and Tabellen," vi. edit. page 58. † Equivalent to 4 ccm. of 40 % solution

DECORATIVE TAILPIECE

Design and Block by
THE L.C.C. SCHOOL OF PHOTO ENGRAVING

DEVELOPMENT OF COLOUR-PRINTING FROM PRE-HISTORIC AGES TO THE PRESENT DAY.

By CHAS. T. KOCK (Cincinnati, U.S.A.).



CONSOLATION.

Engraved by E. HAMEL & Co

Photograph by J. W. TOOTILL.

WHO the first colour-printer was is not easily determined, for the reason that he lived so many centuries before the beginning of Occidental history that the records of his work antedate even tradition. His home was probably in either China or Japan, where, with the same painstaking care which is characteristic of the artists of those countries to-day, he carved his tint blocks lengthwise with the grain instead of across it as with us, and taught Mougol and Tartar and Aina the principles of pictorial art.

His colours were crude, the lines of his drawing weird and fantastic—almost unintelligible to the Western mind; but little by little his ideas developed, in Japan at least, until at this day the humblest Japanese peasant has an intuitive art and colour perception wholly unknown to any other race.

There artists need no elaborately-worked-out colour scale to help them in harmonizing their tints, their sense of contrast, of heightened and softened effect is instinctive, so that the colour results appeal to us, even where the design repels. For centuries these shut-in races boasted the only colour printers in the world, but with the dawn of the early Middle Ages a two-fold form of the art arose in Europe.

Colour-Printing in Block Books.

The primitive block-books, having the illustrations and text of each page cut on a single block of wood, offered an opportunity for colour-printing of which the early bookmakers availed themselves to a certain limited extent, but without any very pronounced advancement.

Some of the pages were printed in a single tint, while in other cases the illustrations were printed in black outline, and afterwards coloured in flat washes by hand. The results were, of course, crude attempts at art, and the latter method may, indeed, scarcely be called colour-printing at all; but it was certainly a precursor of the modern art. Many attempts of this style of hand-coloured illustrations are extant, in which the liberal use of red affords ample proof of the gaudy taste of the book-loving public of those days.

But this style was not confined to the period of the block-book. After the invention of printing, about the middle of the fifteenth century, the necessity which was forced upon the early printers of imitating the productions of the scriptorial bookmaker caused them to make lavish use of colour in the literature which came from their presses. Spaces were left on the printed page for the

most elaborate hand-illumination, and blanks were left for the insertion of the most intricate hand-painted initials. Indeed, the art was worked up to a high degree of excellence very shortly after the invention of the first press. Colour after colour was added to the printed pages, until it is no uncommon thing to find specimens of incunabula containing as many as eight and ten colours on a single sheet

Lithography as a Colour Factor.

The advent of lithography seems to have afforded no suggestion to the colour-printer for many years after its invention, in 1796; but later on it became the most important factor in the art. It was responsible for the chromo-lithography which flooded the country during the middle of the last century, and perhaps did as much to debase the art taste of the public as anything else Garish and untrue to life as were the majority of the colours employed, the products were at least cheap, and so found their way into thousands of homes, in many of which they unhappily repose to-day.

Not that all cromo-lithographs belong to this category. About the year 1875 an art firm began their manufacture and raised them to a true artistic standard, taking the best subject they could find, sparing no expense in reproducing them as nearly in facsimile as possible, and of many of them it is true that at a distance of ten feet it was hard to distinguish them from genuine oil paintings. These "oil chromos" were not cheap; from ten to thirty colours were employed in their reproductions, and they ranged in price from $3 (12s. 6d.) to $25 (£5). At these prices they were eagerly bought the country over, but they had one drawback. Owing to the limited number of subjects, the designs became common and one would be coming face to face with the same picture in dozens of different houses This made them unpopular with art lovers.

Photography takes its Place.

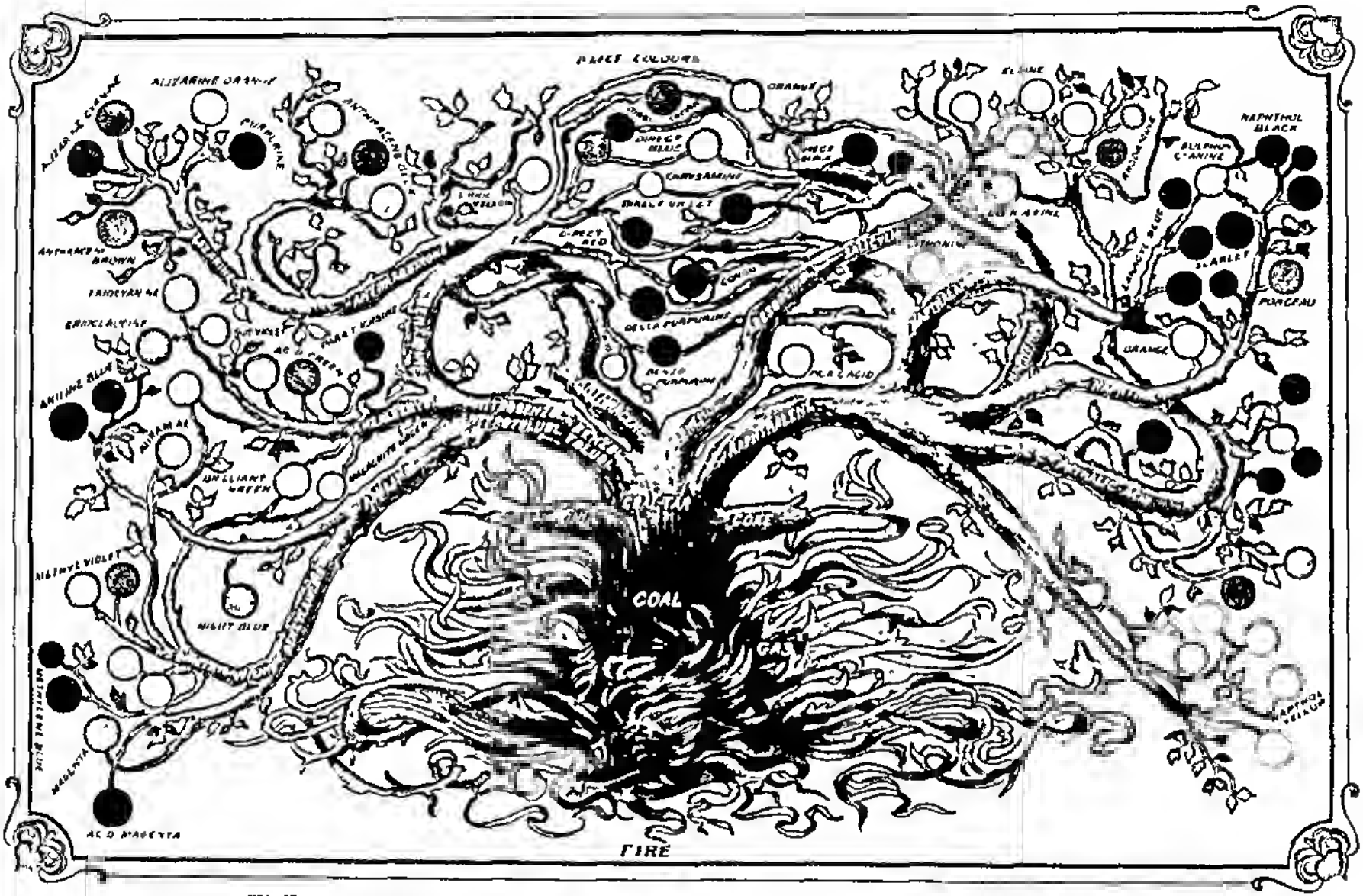
In the early seventies photography began to play an important part in colour-printing. Experiments began to be made in collotype, or gelatine printing, which is to-day the most and only important process in the manufacture of postal-cards, also known as heliotype and, in fact, by half a dozen other names.

Then in 1881 came the invention of the crossline, sealed screen half-tone process, by Frederick E. Ives, and true art colour-printing took its place as an exact science in commercial ranks. Of course, long before that time lithographic colour work had reached a high state of perfection, but in letterpress work nothing had been found which might be termed even half-way successful until the half-tone process developed its possibilities

Two and Three-Colour Printing.

The study of photography brought to light the orthochromatic values of the colours, and the tint blocks were prepared upon true orthochromatic scales. Two and three-colour printing followed, and at the present day have arrived to such a degree of perfection that in three-colour work it is possible to reproduce a painting or natural object even more accurately than can be done with thirty colours on a lithographic press. The possibilities of two-colour work are not so well known by the majority of the art-loving public, but they are no less wonderful, and in many instances an art subject in five or six colours can be reproduced in two colours with a fidelity which is little short of marvellous. This is not always done by the actual reproduction of the colours, but by suggestive colouring, by which the tints are so handled and modified as to suggest the original colours.

Such is an outline of the history of the art of colour printing; its future lies in the hands and brains of the colour-printers themselves.



THE WONDERFUL RANGE OF COLOURS DERIVED FROM COAL-TAR.

Displayed graphically according to groups.

(Reprinted from The Harmsworth Self Educator)

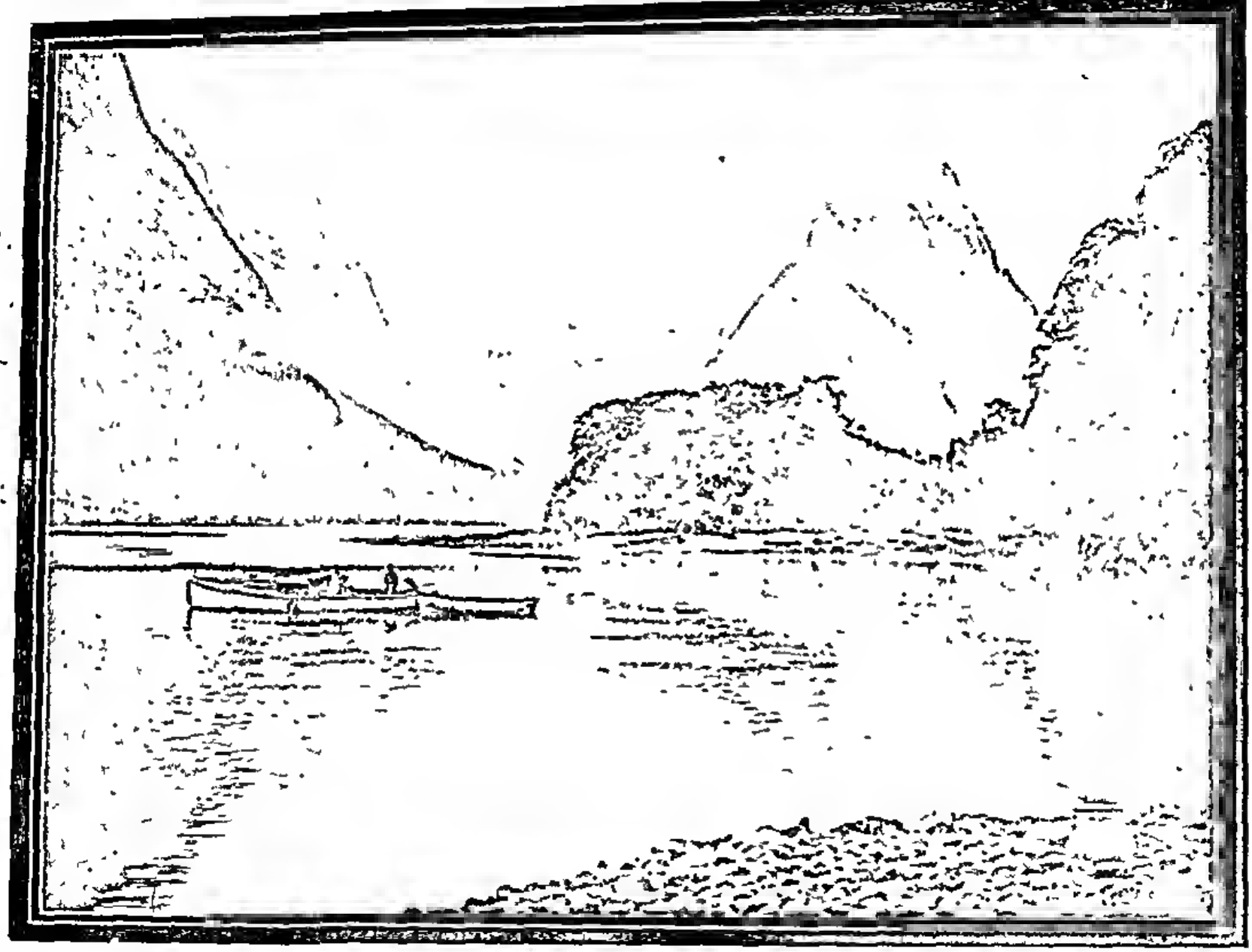
PHOTOGRAPH BY GREENFIELD BROS.

A PORTRAIT STUDY.

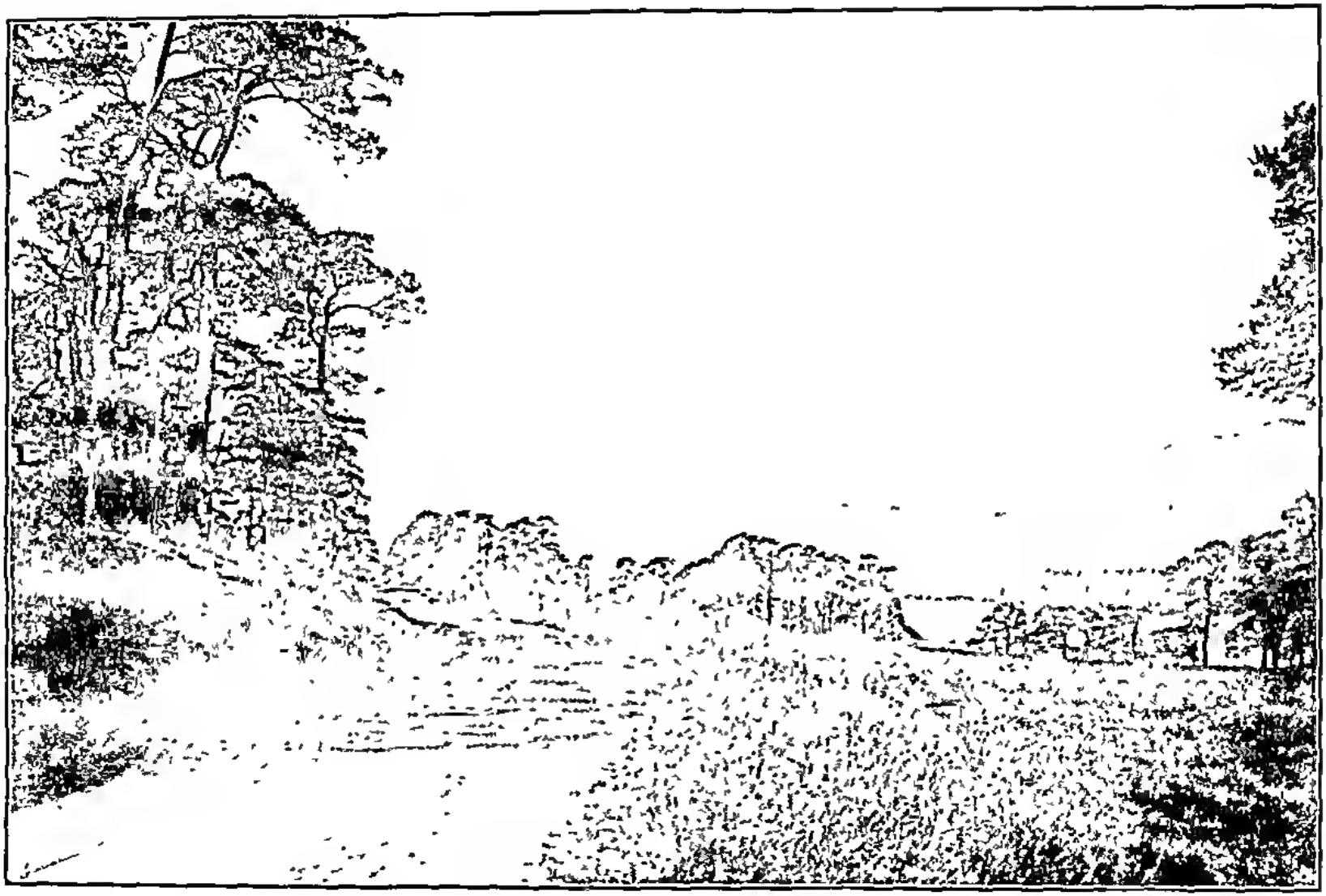
PHOTO BY KUNO REITZ.

GROVE MILL, WATFORD.

Harrand & Fuller.



MITRE PEAK AND SINBAD GULLY.



PHOTOGRAPH BY C. B. BEST.

AMONG THE WESTERN HIGHLANDS.

Gilchrist Bros.

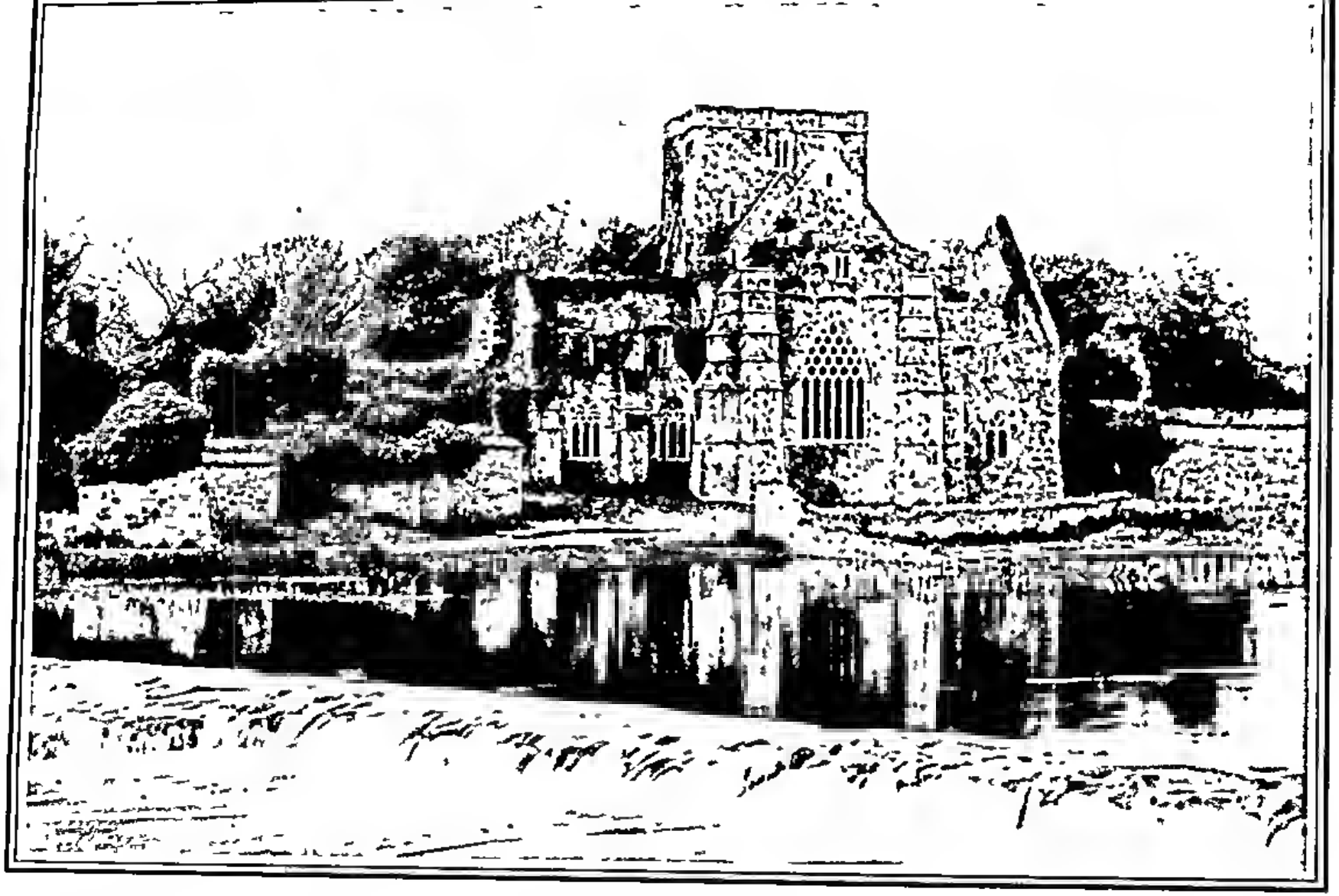
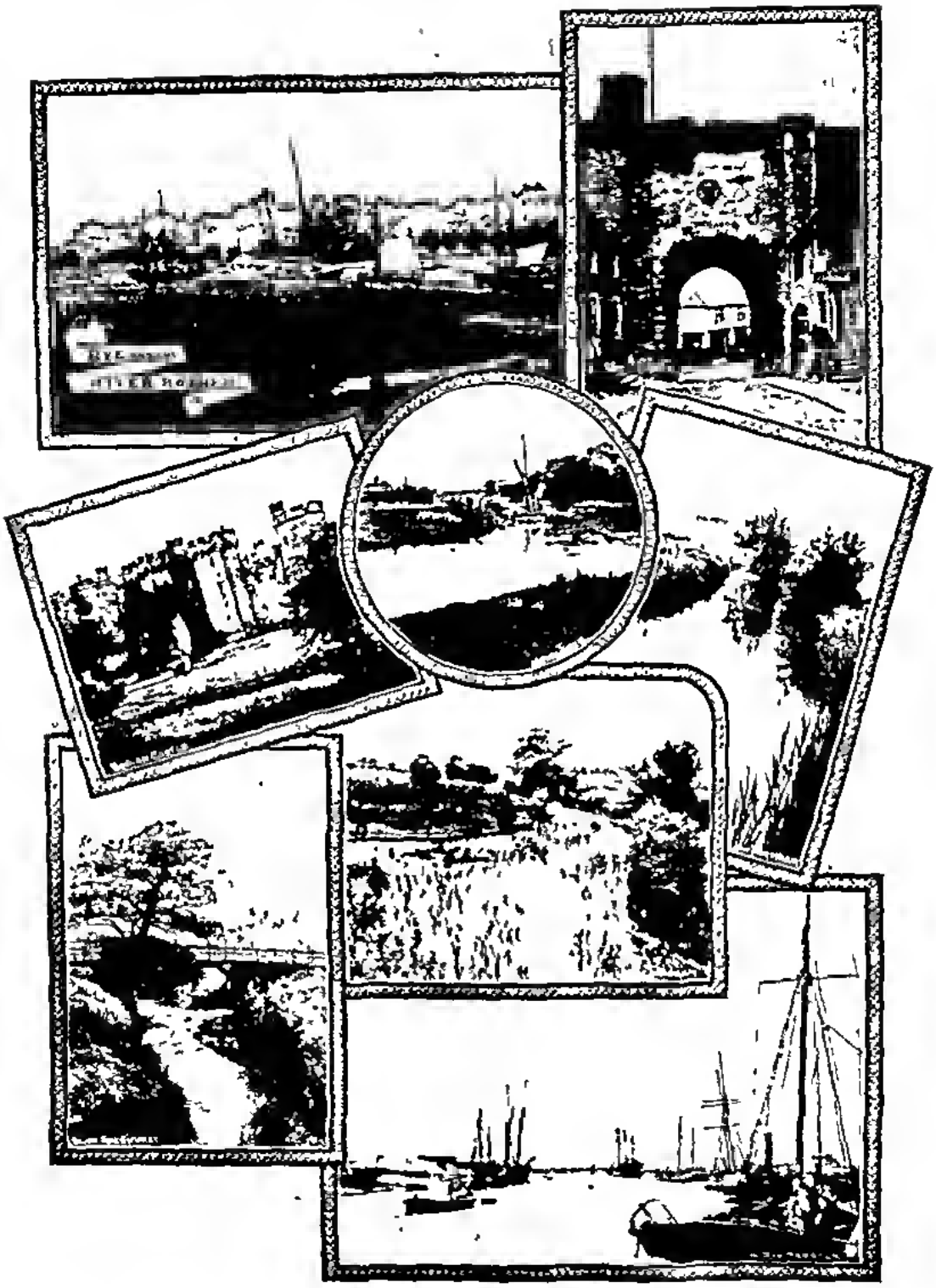


PHOTO BY R. WELCH

HOLY CROSS ABBEY.

W. & G. Baird, Ltd.



PHOTOGRAPHS BY THE LONDON ETCHING COMPANY

VIEWS AROUND RYE.

The London Etching Company.

DUPLEX PHOTO LITHO TRANSFER PROCESS

(Sharecross's Patent)

AMPHITYPE.

Example of Litho Prints from direct and reversed

Photo-Transfer Copy from the same negatives

"AMPHITYPE:" THE LATEST PHOTO-LITHO PROCESS.

By JOSEPH GOODMAN.

"THE GENTLE ART"
(AT HAMPSTEAD)

Photograph and Block by
W. C. KEENE

THIS is a new "Photo-litho transfer process," which possesses many signal advantages over that of the older, orthodox, bichromatized gelatine transfer method.

It is much simpler to work, more convenient and accommodating in the handling of it, infinitely quicker in procedure and application, biramous in its transferring powers, giving either negative or positive transfer at will, or both in succession from the same paper; it possesses permanent keeping qualities in the sensitive state; it will yield a positive transfer from a positive copy direct, without the aid of a negative, or through a negative operation, it transfers to stone, aluminium or zinc plate perfectly with one pull through, along with a few other minor attributes which could be placed to its credit, but which, we think, it is unnecessary to here enumerate.

The basis of the sensitizing principle in this process is gum or gelatine and ferric salts, instead of the gelatine and bichromate salts of the older process. The paper is coated in "roll-web lengths" with the sensitive emulsion, and will keep *indefinitely* in this always ready-for-use state, if reasonably protected from light and moisture, requiring no further preparation whatever, and can be cut off the roll for immediate use at any time.

The inventor and patentee of the process is Mr. H. J. Shawcross, B.E., of the Water Engineers' Office, Liverpool, who has protected it with patent rights taken out in Great Britain, France, Germany, Austria and America.

The rapidity with which copying can be accomplished by this new process will come somewhat as a surprise to users of the bichromate method, as may be elicited from the fact that exposures made through a wet-plate negative require only one and a quarter minutes to complete, using an enclosed arc electric light; whilst for direct copying through an original print on ordinary tracing or thin paper two or three minutes suffice, according to the thickness and translucency of the paper.

This "Amphitype" process should prove useful to process houses, as well as to lithographic ones, inasmuch as it will permit of composite transfers being made up from different negatives or prints off a number of complex subjects, for immediate transferring to zinc in their entirety, at one operation, and without any mutilation of the original negatives, with, moreover, the ink of the image lying direct on and in the metal plate, thus forming a firm support for the acid-resisting powders necessary for the subsequent etching operations in the making of a line relief block.

For *urgent* facsimile work it should prove a boon, especially where the original is drawn or printed on translucent paper, and for engineers' drawings, architects' plans, surveyors' maps, etc., executed on tracing paper or cloth, this process will yield perfect transfers to zinc ready for etching, without having to make a glass negative or requisitioning the aid of the camera for this type of work. With this proviso, however, that absolute accuracy of scale is not a dominating condition, as on the larger sizes there is a slight expansion of the transfer, where heavy nip pressure is used in the transferring; yet when the small amount of the stretch is taken into consideration, and the fact that the scale chart on the sheet also expands in unison and conformity, this drawback will not be fatal to the major portion of this class of work, which is of the smaller size, and where this tendency does not reveal itself in an adverse degree.

This inclination to stretch in the mammoth sizes is capable of being neutralized or perhaps eliminated altogether, if some such measures were taken after the manufacture of the paper, as waterproofing the back of it, or preliminary heavy calandering of it. We throw this out as a suggestion to the inventor.

For lithography it adds another valuable support, with which its premier position will be strengthened and its edifice still more securely buttressed against assault from less perfect processes, in the cheaper ranges of work; in this it is most noteworthy that the path of all the recent developments and inventions in process leads direct to the lithographic craft, and specially lend themselves to adaptation by it with infinite advantage to its welfare; the apparent chief drawback to their speedy realization being the unfortunate pervading conservatism to old methods still fostered in the trade, and the tardy recognition and conception of the vast possibilities of engrafting these modern innovations on to, and into, the older order of the craft.

It is safe to affirm that no branches of the graphic crafts have been enriched with such a wealth and profusion of new and potent forces, generated for its especial benefit, as what the lithographic profession has recently been endowered with; yet none could have been much slower to exploit and avail themselves of its immense advantages than what it has itself displayed through these golden opportunities offered. With the successful advent of *aluminium* and *rotary machines*, with the *irregular* grain *Metzograph screen* for tri-colour and chromo work; with the *Gigantograph* for mammoth litho and poster work; with the valuable *Sear's high-light litho* process; with the *Frey chromo-litho process*; with *Wetherman's Aristochrome*; with the revolutionary new *rotary rubber offset* principle and the train of new devices it has brought into being and direct service for its own use; not forgetting the *tri-colour litho rotary*, or the *two-colour litho rotary* now securely established, to say nothing of the host of other adjuncts included in almost every phase of the craft, of which it is impossible to mention even a tithe of them here, on the apparatus side alone.

Yet with it all, there has been lacking that masterly organizing genius, who could marshal and array in economic order the proper inter-sequence of these valuable forces; so that they could be universally utilized for the trade at large, and command that enthusiasm of espousal which their capabilities warrant them.

To return, however, to the "Shawcross" process. It affords the lithographer the privilege of releasing many of his costly machine stones and utilizing them for other work, as impressions can be pulled from the work in black ink on tracing cloth or translucent paper, and stored away until a further edition is required of the job, when a new and fresh transfer can be immediately made by means of this transfer paper, direct from this ink impression of the original job.

These transfers are procured without in any way damaging or injuring the

original, which may be used again and agaio for the same purpose of producing fresh transfers whenever required without being in the least impaired.

Virtually almost any length of copy can be reproduced by this process, if a large semi-tubular printing frame of the "Hall" type be employed for the copying. Or prints can be made from the largest size of either glass or paper negatives, positives, etc., in line or stipple.

Sharper transfers can be secured in the making up of a sheet of repeat multiple transfers, as each can he taken from the original copy itself, thus escaping the customary thickening when retransferring from a transferred original.

Already one firm, Messrs. G. Poore & Co., of Liverpool, are extensively using this process, under licence from the patentee, for copying Engineers', Architects' and Surveyors' plans and drawings, and have even accomplished large litho transfers by this method which ordinary lithographers would have considered unpractical by the older transfer method.

We do not wish in any way to disguise the fact that the process has its drawbacks, as what process has not? But many of these can be successfully coped with, when experience of manipulation has been acquired. For instance, much of the success of the process depends on the inking up the transfer with the proper ratio of ink; too much causing a heaviness, whilst too little is apt to cause ragged lines. Again in transferring, too much moisture left on the transfer impairs the result somewhat. Practice will, however, rectify much of this.

From an experience of eight months' working of this process on many classes of work, in which we have put it to some severe tests, as transferring on to a cold stone, and proving in various refractory colours, we are satisfied that it is a valuahle addition to the realms of photo-lithography, and of service to process workers in general.

The rationale of the process may be gathered from the following summary of its

Working Operations.

The "Amphitype" photo-litho paper being ready sensitized, it should not be left open or exposed to direct light from a window.

It is not necessary to employ a dark-room if it is handled quickly and kept shielded from direct or strong rays of light during the adjusting of it to the copy. It should not be stored in a damp place.

The sensitized paper is cut to a size slightly larger than the subject to be copied.

This subject or copy is then inserted in an ordinary process or other photo printing frame, with the sensitized paper behind it.

The exposure may be judged with certainty, by using an actinometer. The correct standard of time may be resolved by testing with some narrow strips of the paper, exposed to various periods of time, beneath a similar piece of translucent paper to that on which the drawing to be copied is to be made, on which some inked lines are drawn; then withdrawing these and testing them by development from time to time as the exposure proceeds.

The paper alter exposure reveals but the merest trace of light action, but in this "photo-impressed" state it will keep indefinitely if kept in the dark.

Either positive or negative transfer copies can now be developed from it at will, according to the requirements of the case.

For Direct Positive Photo-Transfer Copy.

The exposed paper has now flowed over it a saturated solution of ferrocyanide of potassium (yellow prussiate of potash); this can be done in a large dish, or a

specially made wooden trough fitted with a collecting well at the bottom This ferrocyanide solution can be used again and again.

As the result of this operation the copy of the drawing will immediately flash out in blue lines, on a buff ground, the Ferrocyanide having reacted on the unexposed parts of the film protected by the black lines of the copy.

When the copy is sufficiently distinct, further development is stopped by immersing it in a bath of water, or flushing the sheet all over so as to stop the chemical action, at the same time carefully rubbing the sheet with a swab of moistened cotton wool, or a soft sponge, so as to free the lines of any adhering particles of loose substance that might be clinging to them.

If the work is being carried through in batches, or in a continuous order, these developed sheets may now be hung up to dry naturally, which is very soon accomplished, as the surface is not so absorbent of moisture as what the bichromated gelatine one is.

If, however, the transfer is wanted at once, it is then dried before a fire, which can be done in the course of two or three minutes The paper now being insensitive to light, could be stored away anywhere, until it is desired to prepare the transfer for going down to stone.

When dry then, the whole surface is inked with the retransfer ink, using a composition roller in the usual manner; or it may be inked-in by means of a litho stone being charged with the retransfer ink, and the sheets pulled through on this twice or thrice; or the transfer ink may be dabbed on to the paper by means of a pad of cotton gauze.

This inked-in transfer is now developed ready for transferring, by simply immersing it in a 5 per cent. sulphuric acid bath (1 measure of acid to 20 measures of water). This bath is a permanent stock article, and will do for many dozens of copies until, in fact, it becomes too slimy for further use, when it can be quickly replaced with a new one.

The transfer develops in this bath in less than a couple of minutes, it is then removed and placed on a flat board, and there flushed copiously with water, using at the same time a soft pad of cotton wool to remove any of the remaining superfluous litho transfer ink outside the lines of the drawing, and without removing any of the ink from off the actual lines of the image. It really takes less time to do this than to describe it.

If properly done, we have now a perfect transfer which is ready for transferring to either litho stone, zinc, or aluminium plates.

In transferring one pull through alone suffices to effect the transfer. It may now be prepared and etched in the usual planographic manner, when it is ready for the machine; or if it is intended for a line relief block, then it is ready for powdering and etching in the usual way.

Transfer from Glass Negatives.

If a transfer has to be made by means of a glass negative, the transfer paper after exposure is at once inked-up with the thinned-down retransfer ink, and then developed in the ferrocyanide bath, afterwards well washing in water, and is at once ready for transferring to stone or plate.

Negative Transfer.

If a direct negative or transposed photo transfer is required the exposure is made the same as has already been described for the positive process, and then inked up with the transfer ink; it is then immersed straight away in a bath

of ferrocyanide of potassium and developed, finally washed in clean water and is now again ready for transferring.

We may here lay stress on the fact that a positive transfer can afterwards be obtained from the same piece of transfer paper, from which a negative transfer has already been obtained. Thus both negative and positive photo-transfer copies can be procured from one and the same piece of exposed transfer paper; or both negative and positive copies can be obtained from the same copy, on two separate pieces of transfer paper, for the running down to stone at one and the same time.

If this process meets with the favourable reception which its promotors think it is entitled to, it should afford the process and litho trade the opportunity of securing the enhanced benefits to themselves, which, even though only a small item compared to the other range of work, it may be the rallying point for ensuring safer prices all round.

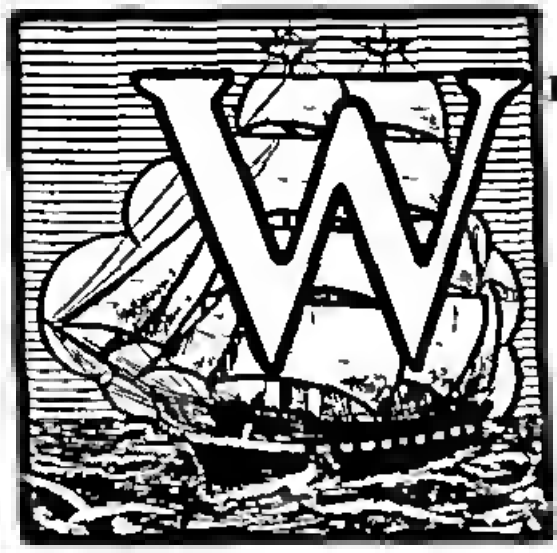
LOW TIDE.

Dry Plate Half Tone by
RELIANCE PHOTO-ENG. CO, DUBLIN.

Photograph by
E. GEO. HAINES.

ON THE ADVANTAGES OF USING A SINGLE-EXPOSURE TRI-COLOUR CAMERA.

By EDWIN T. BUTLER.



Design and Block by the
L C C. School of Photo Engraving

WHAT are the existing difficulties of and objections to three-colour work as at present practised?

The difficulties of correct colour representation by photographic means by any of the three-colour processes such as pre-dyed plates or films, rotary or autotype pigmented films or papers, Sanger Shepherd's process, by collotype or block printing, etc., are not due to imperfection of the underlying principles, which are of themselves theoretically sound, but they are mainly due to unstable and fluctuating conditions incidental to the working which have to be overcome by the ingenuity and skill of the operator.

Most three-colour processes which aim at a correct representation of natural colours are based on the fact that the varying kinds of light rays which reveal all objects in colour may be separated and divided into three groups, and that each of these groups reflected from the object to be photographed may be recorded on three negatives, and that each of these in turn may be used to control in proper degree the amount of colour which constitutes each element of the three-colour picture.

It is found that the three reproduction colours will, when combined in proper proportion, yield a satisfying representation of the object and appear correct.

In order to attain this desirable result it is obvious that each of the negatives ought to record in correct gradation only its due proportion of the coloured light reflected from the object. And from these negatives the prints should be so correctly made that no one colour should be unduly predominant.

Three-colour work requires such nice adjustment of the means by which the end is attained that it is not wonderful if they often fail to secure accurate results. Any departure from relative truth in the density records of the negatives or in the elemental colour prints from them must tend to disturb the proper balance, as will be apparent when comparing the reproductions with the object photographed.

When all the conditions of success are fluctuating the difficulties will be the less easily overcome, but if some of these conditions can be rendered more stable and reliable by standardization, there are greater possibilities of bringing the others into harmony.

In the practice of making three exposures successively the second and third

are often of different subjects. from the first. For instance, in taking landscapes what is one moment in full light is the next in shadow.

The shadows of clouds moving over a mountain side, sometimes with race-horse speed, make a subject which must be taken at a single exposure, or the three negatives will not give unity of effect.

Slight variations in the subject when recorded equally on each of the negatives do not, if taken by three simultaneous exposures, spoil the effect of the print, but if taken by three successive exposures the result is necessarily incorrect.

When making long exposures the light often changes before they are finished, but this is not of moment if the exposures be all made at one time.

By simultaneous exposures, when the light is good, it is possible to have fully exposed seascapes with clouds and breaking waves.

Correctly timed exposures, if successive, must be largely a matter of experiment, unless the ratios can be fixed in a practical manner for the varying changes in the constitution of the light. It is well known that even the same brands of plates vary greatly in speed, and that the spectral composition of light also is very inconstant. These facts under ordinary circumstances tend to great disparity in the density of negatives, and ratios have to be altered in accordance with both conditions. The length of time required and the mechanical difficulties of making successive exposures rule out many subjects.

In regard to the differences due to spectral composition of light, whatever may be the chromatic composition of sunlight before it reaches our atmosphere, it is perhaps never exactly the same by the time it reaches the eye or the photographic plate. If the light be examined through a spectroscope (preferably of a wide dispersion) it will be noticed that the visible length of the blue region sometimes appears very much longer than it does at other times, irrespective of the time of day. This is probably due to cloud haze or fog in the atmospbere containing fine particles of suspended matter, which absorb more of the short actinic rays than of the less refrangible part of the spectrum. The time of day, also, affects to some extent the spectral composition of light as we see it, the atmosphere acting as a lens; at different angles of the sun's rays the more refrangible light is more refracted, hence at sunrise and sunset there is much more red and less green and blue than, say, at midday.

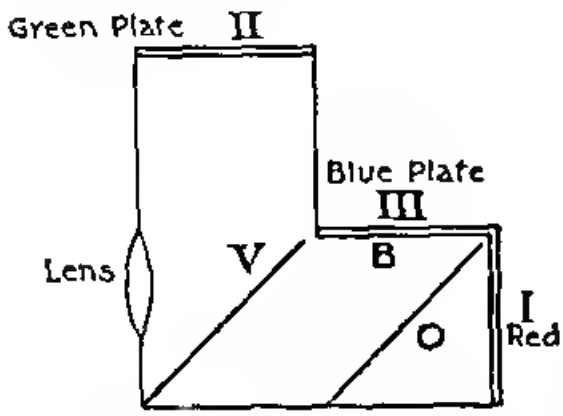
The whole landscape then looks warmer, less green, and it should be reproduced with the same appearance; but a portrait taken under such conditions, viewed in cooler light, would give the impression of being too red.

Some of these drawbacks have been, if not entirely overcome, at least to a great extent mitigated. This is accomplished by the use of a single-exposure tri-colour camera, which takes the three negatives simultaneously, and the full colour values of each of them is secured in the same period of time. The rule for exposures is as simple as for monochromes. There need be no concern as to ratios, the camera regulates these. The camera not only takes the blue and green negatives duly proportioned to the density of the red in the same period of time when the special plates are approximately of the same speed numbers, but prints correct in colour have been obtained from negatives produced from plates of varying speed numbers, such as Wynne's *//67* to *//103*, using Wratten's panchromatic plates for the red along with Verichrome *//89* to *//138* for green and blue. There has seldom been more difference in the general density of the negatives than can be compensated for by the time taken in printing.

When the colour densities of the several negatives are correct a difference in the general densities can be so compensated for by varying the conditions of printing from the three respective negatives.

Description of Camera.

The single exposure camera, which I have now used for several years, is constructed to take one image by direct and two by reflected light. This is accomplished in the following manner.



In the diagram V is a transparent reflecting screen It transmits only the red and blue bands of the spectrum being opaque to the green The light reflected from V passes through a green screen which transmits only the green band of the spectrum, so that the plate II receives only the green rays reflected from the object photographed. The red and blue rays from the object pass through the reflector V, as already stated, and at O are intercepted by a second transparent reflecting screen which transmits only the red rays, so that the plate I receiving these registers only the red rays reflected from the object photographed. The light reflected from O passes through a blue screen B, which transmits only the blue rays, which are received on the plate III and form the blue taking negative. From this it will be seen that the plate I receiving the red image takes the direct light from the lens while the plates II and III receiving the green and blue images takes the reflected light from V and O. The direct light is more intense and so quicker than that which is reflected, while the light reflected from the first reflecting screen is more intense and quicker than that reflected from the second reflecting screen. Advantage is taken of this fact in adjusting the varying ratios of exposure required for the red, green and blue images respectively. The screens are so adjusted by dyes as further to correct for these differences, and the effect of these arrangements is to equalize the exposure for each of the plates simultaneously exposed.

The seven dyes used in the reflectors and screens, and the position of the plates in respect to the light in the camera, together tend to reduce differences in the speed of the light rays and in the speeds of the respective sensitive plates, except such as properly belong to the colour values of the subject. In other words, their screening and partly weakening action do for the light what the presence of fine particles in the atmosphere do in absorbing the short waves of the more actinic end of the spectrum. The reflectors and screens freely transmit the colour rays which are intended to act on the several plates, and so their action is not unnecessarily prolonged.

Rule for Exposures.

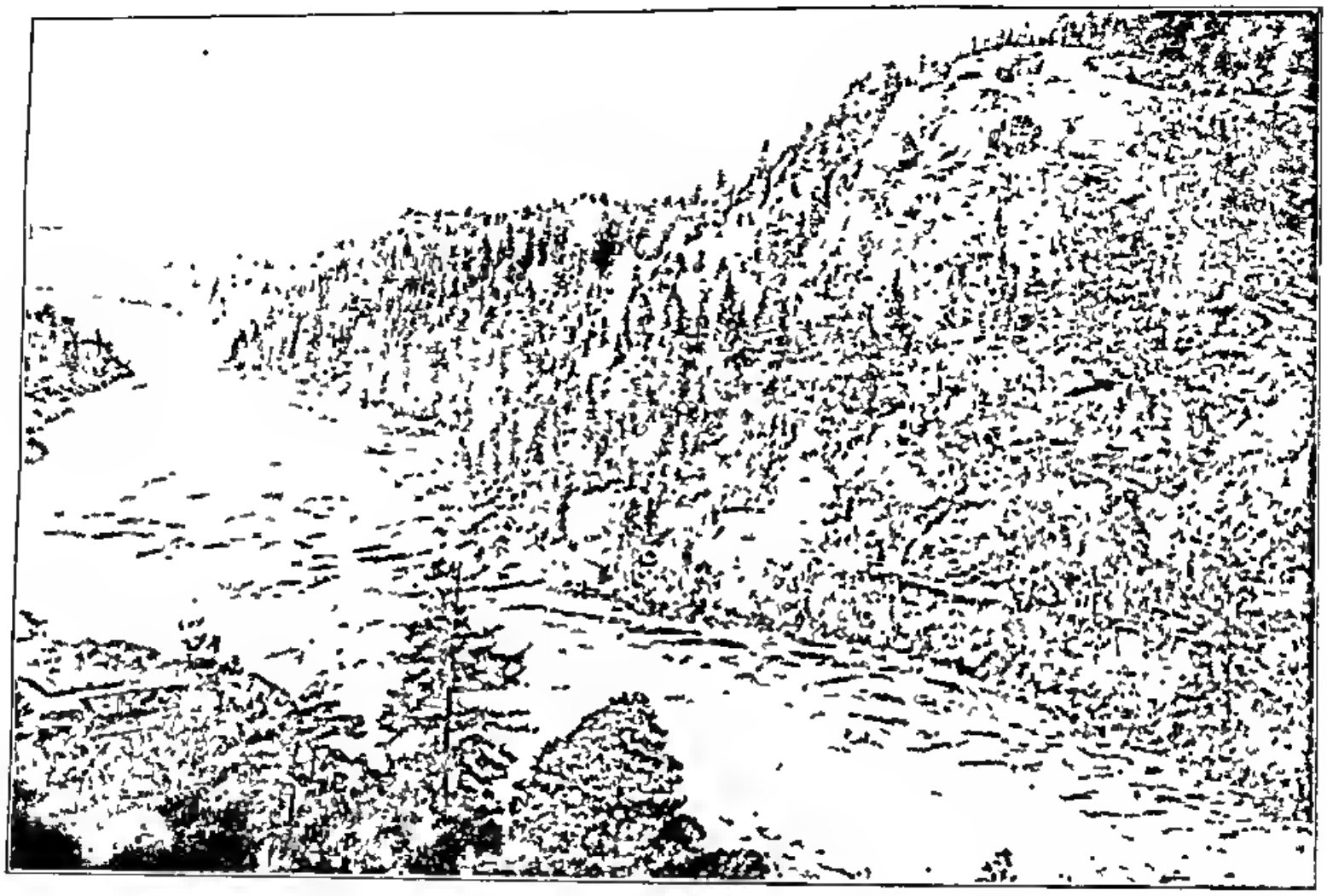
Portraits require $\frac{1}{4}$ to $\frac{1}{2}$ actinometer time at *//6*, using Wynne's *fast paper.*

Landscapes a proportion of actinometer time depending upon the nature of the subject, from $\frac{1}{4}$ to $\frac{1}{12}$, thus when the paper requires 3 seconds to change to a standard tint a right exposure for a light subject such as cloud and sea would be $\frac{1}{4}$ of a second at *//6* Sunsets usually require several seconds.

In conclusion, I would say that such a camera may be easily carried, and one of them has been my companion during many holidays for several years, and carried many hundreds of miles. The camera is made in $\frac{1}{4}$-plate, $\frac{1}{2}$-plate and whole-plate sizes, or it may be stereoscopic.

DUTCH EXTERIOR

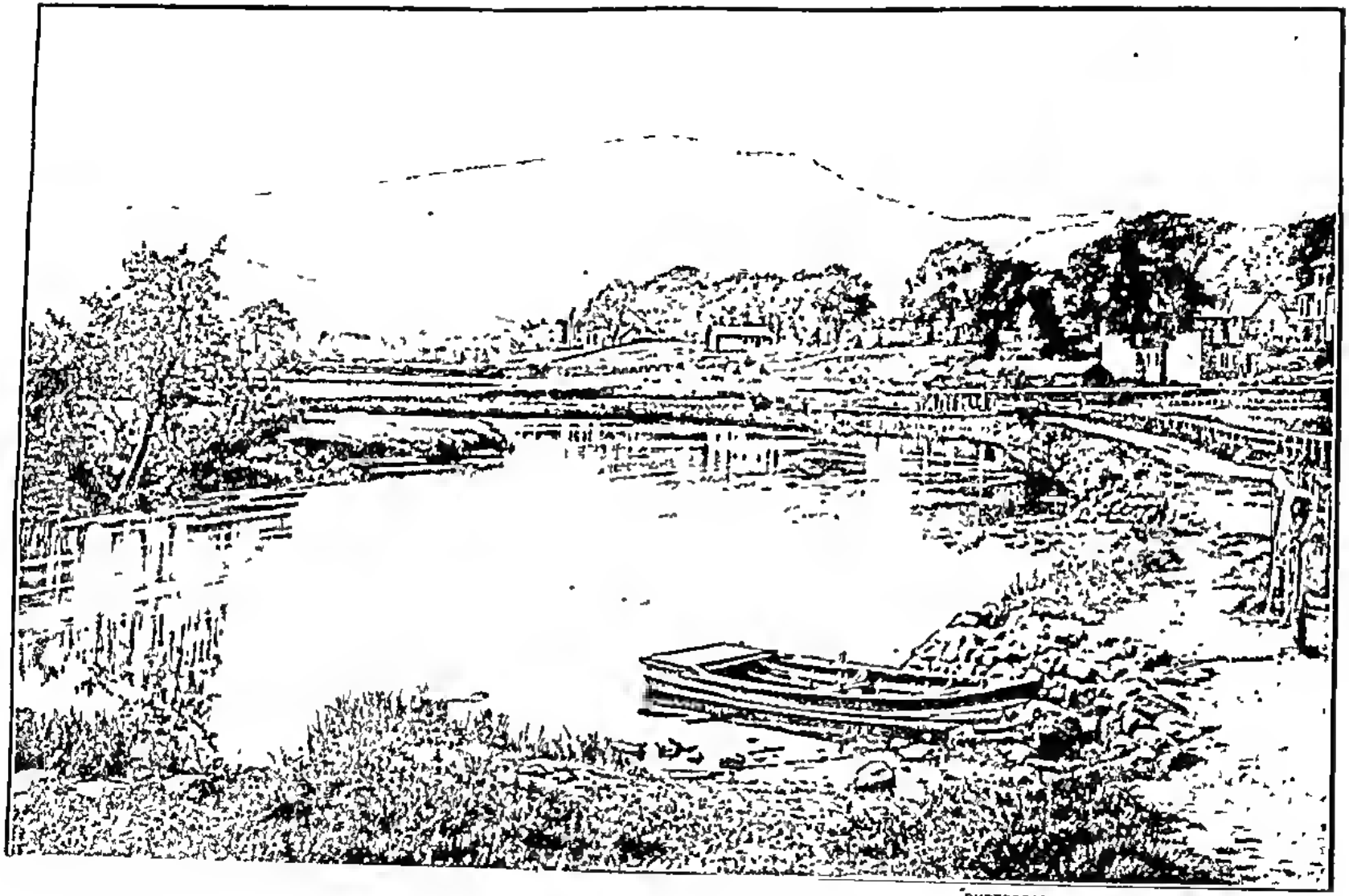
Eilers & Wolf.



VIEW FROM "TROLLHÄTTAN" NEAR GOTHENBURG.

(Half Tone on Brass)

Wald. Zachrisson.

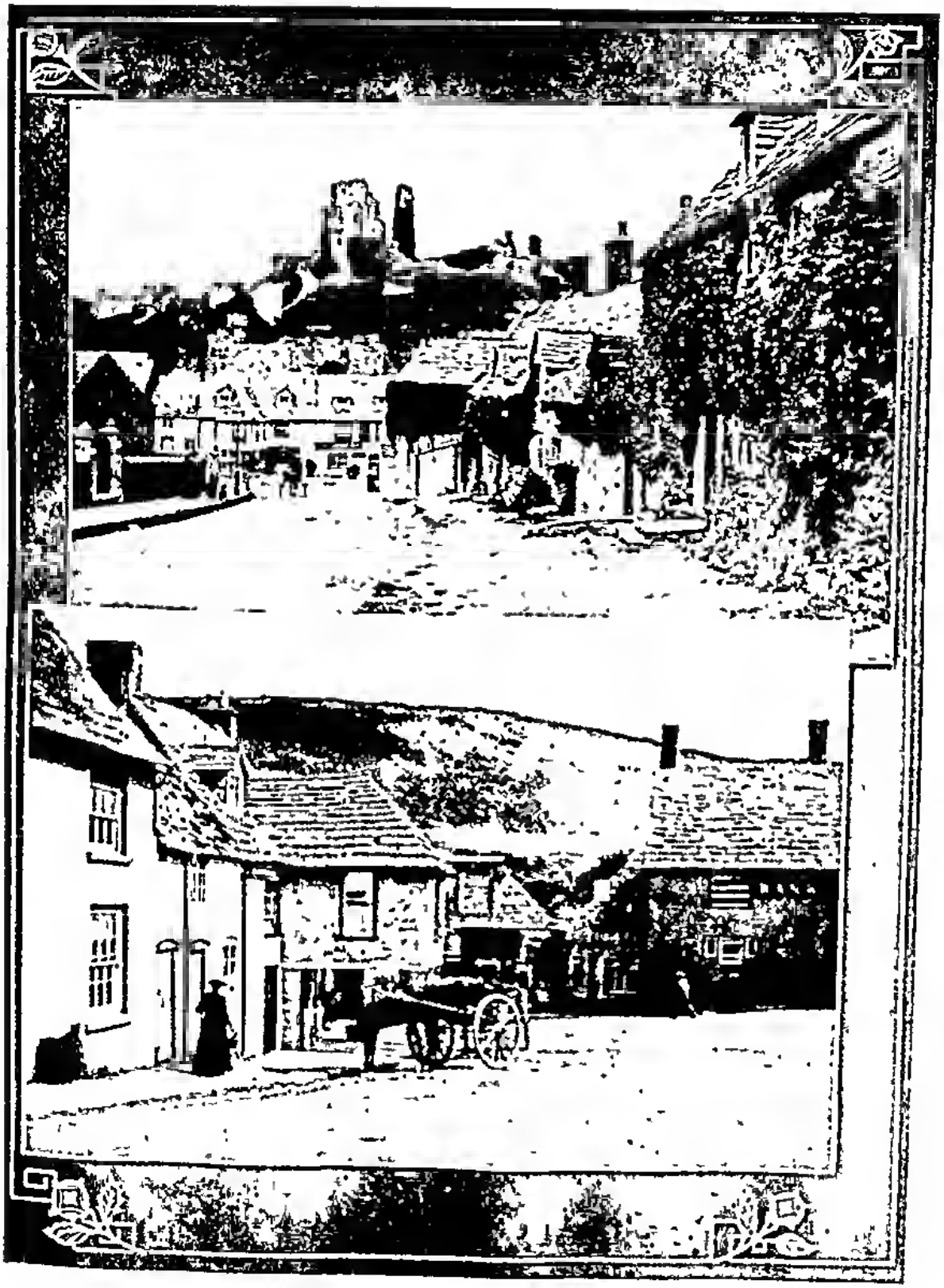


PHOTOGRAPH BY MESSRS VALENTINE & SONS, LTD

BEN LEDI FROM CALLANDER BRIDGE.

PHOTOGRAPH BY REINHOLD THIELE

The Art Reproduction Co., Ltd.



VIEWS AT CORFE, DORSET.

The Arc Engraving Co., Ltd.

PHOTOGRAPH BY LANGFIER LTD

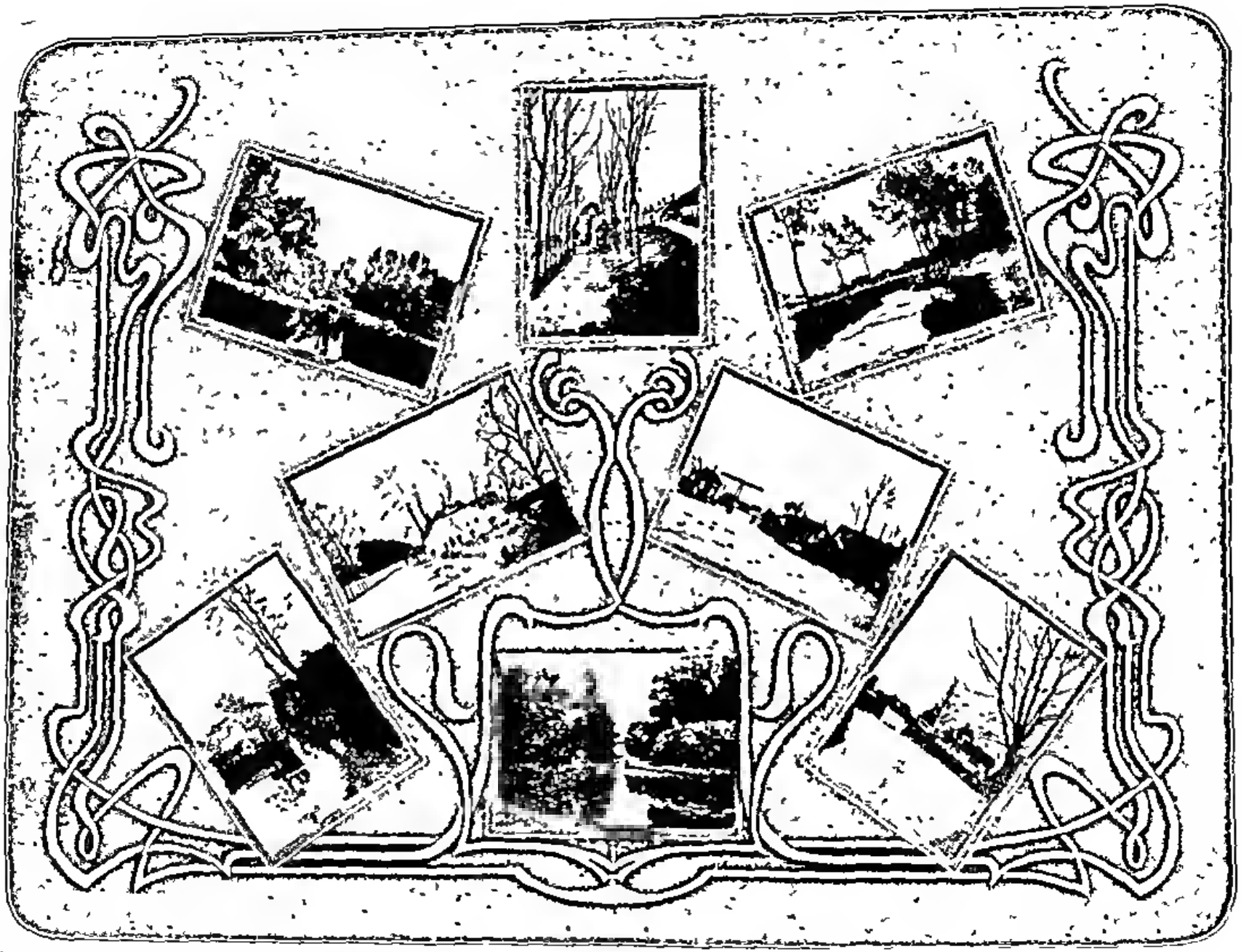
JOSEPH HOLLMANN.

Dean Engraving Co.

PHOTOGRAPH BY LANGFIER LTD.

SIR SQUIRE BANCROFT.

The Art Reproduction Co., Ltd.



VIEWS OF HOLLAND.

Photochemische Compagnie.

DA DREAMS

NG BY MISS HE A HORWITZ

The Amalgamated Press Ltd.

CARBON PRINTING AND THE PHOTO-ENGRAVER.

By A. C. AUSTIN (New York).

SUNSHINE AND SHADOW

Photograph and Design by FRANK W. ADAMS

I BELIEVE photo-engravers have very little appreciation of the many advantages carbon tissue offers them in their every-day work, particularly since it has been so convincingly demonstrated that tissue can be readily and speedily prepared, with a sensitizer containing a large amount of alcohol, permitting the sensitizing and drying within fifteen minutes

Furthermore, a carbon print in photo brown or warm black, carefully handled and developed on porcelain or milk glass makes almost ideal copy for reproduction. The tone values, the purity of the whites and the wealth of detail are all that can be desired, and the facility with which the prints can be retouched and features added thereto or eliminated with perfect matching in colour, fills the heart of the retoucher with joy.

We may well ask, Why is carbon printing so completely overlooked by the photo-engraver? It is simply because he imagines all sorts of difficulties that are big bugbears full of lost time and ruffled tempers. As a matter of fact it is all imagination, for carbon printing as practised by a few and as used by me for specific things is the easiest method for obtaining prints that I know of.

Let me tell you how we handle it, and perhaps the telling will induce you to try.

I don't know to whom I should give credit for the particular sensitizing formula. I don't know that it makes any special difference, only it is necessary to record here that the formula is not original with me, but was borrowed from some one of our many photographic journals. And let me say that there are a lot of good things tucked in here and there between the pages of our journals—much that is good, much indifferent and, sorry to relate, much that is just "rot," but, I have had a deal of my education from trade journals, and I heartily commend them one and all and advise every photo-engraver to read anything and everything in photography and process that can be obtained if he would keep up with the procession.

any desired degree. You will be surprised at what can be accomplished if you but try.

Furthermore, if the tissue has been cut all one way originally, two or more prints may be made from the same negative, and each retouched in the right way to give negatives for a grade of colour work that can be made with a minimum of fine etching. This offers a wide field of opportunity when skilfully handled.

I have tried to call attention to the possibilities that lie with carbon tissue for the photo-engraver. I have purposely omitted any reference to the actual printing methods, presuming that nearly everybody is familiar with carbon printing, and those who are not familiar I would advise them to study some good manual The Autotype Company, of London, publish "The A B.C. of Carbon Printing," which is an excellent book for beginners. In America we have "The Modern Methods of Carbon Printing," by A M Marton, of Bloomington, Illinois, one of the best and most complete books on the process that I know of.

Once again let me urge you not to overlook carbon printing.

MARBLES

Block by
"WESTERN MAIL," LIMITED

Photograph by
R. BRAID

REPRODUCTION FROM AN OLD BATTERSEA ENAMEL.

Vaus & Crampton, Ltd.

MODERN IMPROVEMENTS IN BLACK INK MAKING.

By H. B. HOLDING (Binney & Smith Co.)

"A Bird in the Hand——"

Block by Hill & Co. Photograph by Brenner

ANYONE comparing the leading pictorial magazines and even the cheaper kind of illustrated periodicals issued to-day with those published twenty-five or thirty years ago, must find many reasons for satisfaction and congratulation at the enormous progress which has been made both in quality and technique.

The fact that engraving on wood and steel has almost become a lost art may cause heart-burnings to many, but the excellence of recent modern block printing and half-tone process work goes far to compensate for the loss of the former methods, as the reproductions of the present day, in black and white as well as in colours, are so far in advance of those printed even a decade ago that they must cause wonder and amazement to the most casual observer

To bring this about the best brains have been devoted to the improvement of technical education and to the adaptation of mechanical contrivances, while the highest branches of science and art have been invoked to achieve the magnificent results so frequently manifest. Improvements are obvious in so many ways that to enumerate them all would fill a volume of The Process Year Book, each issue of which synchronizes with the latest developments in every direction.

I have, however, much pleasure in again acceding to the kind invitation of the Editor to contribute another article and gladly take the opportunity of pointing out only two of the many differences which are noticeable between the new order and the old, *viz.*, (a) in the absence of deterioration in black printed matter and (b) in the better effects obtained from the use of the best qualities of black inks now being supplied by the leading printing ink makers of the United Kingdom.

In connection with the former (a) it will be noticed that in many old books and newspapers a kind of yellow halo often surrounds each letter. This fault was pointed out so long ago as 1894 by the late Dr. Robert Irvine (many years chemical director of Messrs. A. B. Fleming & Co., Ltd., the well-known firm of printing ink makers, of Caroline Park, Edinburgh) who, in a paper read before the Society of Chemical Industry, attributed this to the presence in the lamp blacks used for the inks of Chrysen and Pyrine, which, being dissolved in the varnish during the process of printing ink making, had the effect of making the printed matter appear to "rust" as a result of chemical reaction. Investigations have proved that Dr. Irvine's contention was correct, for, owing to the necessity for obtaining a good colour, a proportion of free oil was allowed (during

the process of combustion of the creosote) to remain in the vegetable (or lamp) blacks manufactured at that time in Great Britain, and from which the printing inks then in use were almost exclusively made. As there was then no other black pigment suitable for mixing therewith for the purpose of improving the colour (charcoal and other levigated blacks not being adaptable owing to their gritty character) the black makers were content with the imperfect combustion of the raw material which resulted in so many impurities remaining in the black. During the last few years, however, the difficulty has been overcome by the more scientific methods adopted (under the American process of black making), by which all impurities are eliminated from the coal tar oils. By this method the lamp black is robbed of much of its colour, but purity is obtained, and the lack of density and body is overcome by the introduction of American gas black (or carbon black) in varying proportions. The effect is that, all deleterious substances having been eradicated, the disadvantages complained of by Dr. Irvine need no longer apply.

While the incorporation of carbon black in printing ink has ensured greater purity, it has also been the chief source from which (b) the better effects have been obtained in modern typographical work and half-tone printing. For just to the extent to which the proportion of carbon black in the ink is increased, so brilliancy of tone and density of colour are obtained. Owing to the peculiar formation of carbon black—it being granular, whereas vegetable black is foliated—some of the British printing ink makers find it rather difficult to grind, and therefore hesitate to use it to the same extent as their American confrères. This objection does not, however, apply to Peerless Black, which possesses exceptional flowing properties, as well as excellent colour and brilliancy, and some of the highest grade litho and half-tone inks are now made exclusively from Peerless Black, the use of which is annually increasing; to such an extent, in fact, as to necessitate an enlargement of the plant at the works at which it is produced.

The enormously increasing use of carbon black in all parts of the world, not only for printing ink, but for many other purposes, raises the question of whether the supply of natural gas in America is, and will long remain, sufficient to meet the ever-expanding demand, especially when it is remembered that to make one pound of ordinary gas black between 2000 and 2500 cubic feet of gas have to be consumed, and for Peerless Black a larger quantity. Natural gas was first discovered in the States of Pennsylvania and New York, but as population and industries increased in those districts the supply of gas available for black making become commercially impossible owing to the fact that it could be used more profitably for light, heat and fuel, for which purposes a price of 10d. to 1s. per 1000 cubic feet can be readily obtained.

Prospectors then visited other localities (remote from "civilization") in search of cheaper gas territory and, fortunately for the numerous users of carbon black (whose business would in many cases have been ruined had no natural gas been commercially available), large tracts of gas lands were discovered in the State of West Virginia, where a sufficiency of supply appears possible—at any rate for some years to come. All natural gas, however, is not suitable for black making, as some of it contains sulphur. There are differences also in the quality of natural gas in sections far apart. For instance, the gas found in Pennsylvania differs from that in Indiana. The latter contains a smaller percentage of carbon. Its density is less and it is composed of lighter homologues, so that the same volume of gas does not pass through the burners, consequently a less quantity of black per plate or pan is produced than from the heavier gas.

Many are the adventures and trials of the "Pioneers of Industry." When

your readers are dwelling upon the romance of commerce let them give a thought occasionally to those by whose less-known efforts the world moves to greater perfection. At these moments let them think not only of those whose activities in the artistic and scientific sphere are apparent to the casual reader, but also to the black maker whose difficulties and problems are also great.

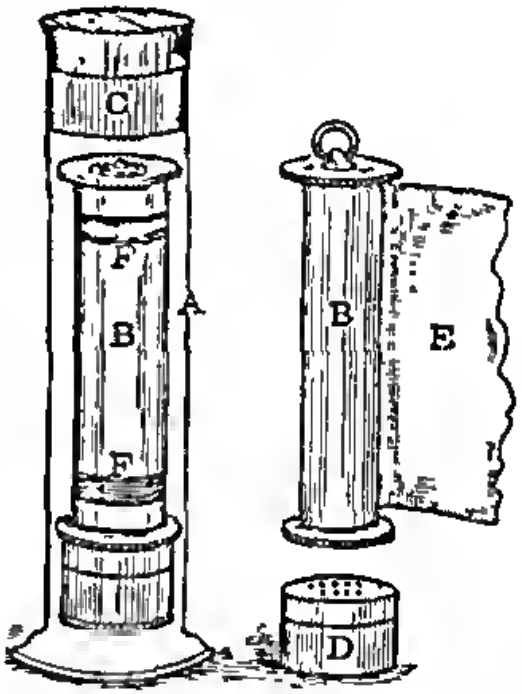
As previously stated, the noted Peerless Black takes a larger quantity of gas to produce a pound than any black, and the process by which it is made is entirely different from that employed in the manufacture of other carbon blacks. As in the case with so many exceptional products its discovery was the result of chance. There have been many attempts made to produce a similar grade of black, but it is not likely that any of these will succeed, because of the many intricacies and peculiarities which are incident to its manufacture. The greatest care has to be taken in producing it. Instead of the raw flame from the pipe of the gas well impinging immediately on the plate, as is the case when ordinary carbon black is being made, the natural gas for Peerless Black is collected in gasometers, so that the pressure of gas in the buildings is at all times regulated. As much water as possible is taken out of the gas by a series of drips along the pipe lines. To prevent the freezing of the gas in winter small holes are bored in the supply gas pipes which lead from the well to the works, and a flame is allowed to proceed from the pipe and to strike upon sandstone, which is built around the piping. Thus the gas is kept at an even temperature. The pressure of gas passing through the burner must at all times remain constant and uniform. The rollers upon which the black is collected must be exactly of the same diameter and must be kept at a certain temperature. All the burners must be exactly alike and the flame must strike the roller at a certain point in the flame. A sufficient supply of air is admitted and so regulated that each flame has an adequate and equal amount. The black must be allowed to remain upon the rollers a definite time. Absolute harmony must exist throughout the whole plant, or otherwise it is not possible to produce a black having the peculiar characteristics of "Peerless"—the merits of which have been frequently dilated upon in your valuable YEAR BOOK, and are so well known and recognised by the leading printing ink makers in all parts of the world. The carbon in Peerless Black is in such a finely divided state that greater body is given to the ink and a more intense blackness is obtained when printed on paper. A larger quantity of Peerless Black can be used to a given quantity of varnish than is possible with ordinary carbon black *without impeding the flowing properties* of the ink, in consequence of which the ink made from it is peculiarly adapted for half-tone or process work, in which the ink is required to fill in all the fine lines cleanly and clearly and at the same time to effectively display the deeper effects of the block.

A PRESERVATIVE BOTTLE FOR PLATINOTYPE PAPER.

By S. K. LAWTON (Jaffna, Ceylon).

Design and Block by the L C C School of Photo-Engraving

THE well-known tendency of platinotype paper to deteriorate in presence of a damp atmosphere is very pronounced in certain districts of Ceylon, where, in some seasons the air is so much overcharged with damp that the ordinary tin receptacles with rubber bands afford very little protection The following bottle entirely prevents access of damp to the paper, which is found in good condition after remaining stored in it for over two months.



A is a cylindrical glass bottle with C a tight-fitting rubber cork; B a wooden roller with circular metal rims at top and bottom with a long strip of thin leather or varnished black paper E affixed similarly to Kodak spools. The chloride of calcium is put in round box D, with perforated top. The paper, on removal from the original tin, should be tightly wound round the roller with the leather or paper over it, and the whole secured by rubber band F, or string; the calcium box being placed at the bottom, the rolled-up paper is inserted and the bottle corked. The black covering paper and the bottle should be dried over the fire at first to expel any existing moisture. The platinotype paper thus kept is perfectly protected as no air can possibly get access to it.

"WAITING TO BE SHORN."

A. E. Dent & Co.

PHOTO BY F. G. O. STUART

THE FLOWER SELLER.

Hill & Co.

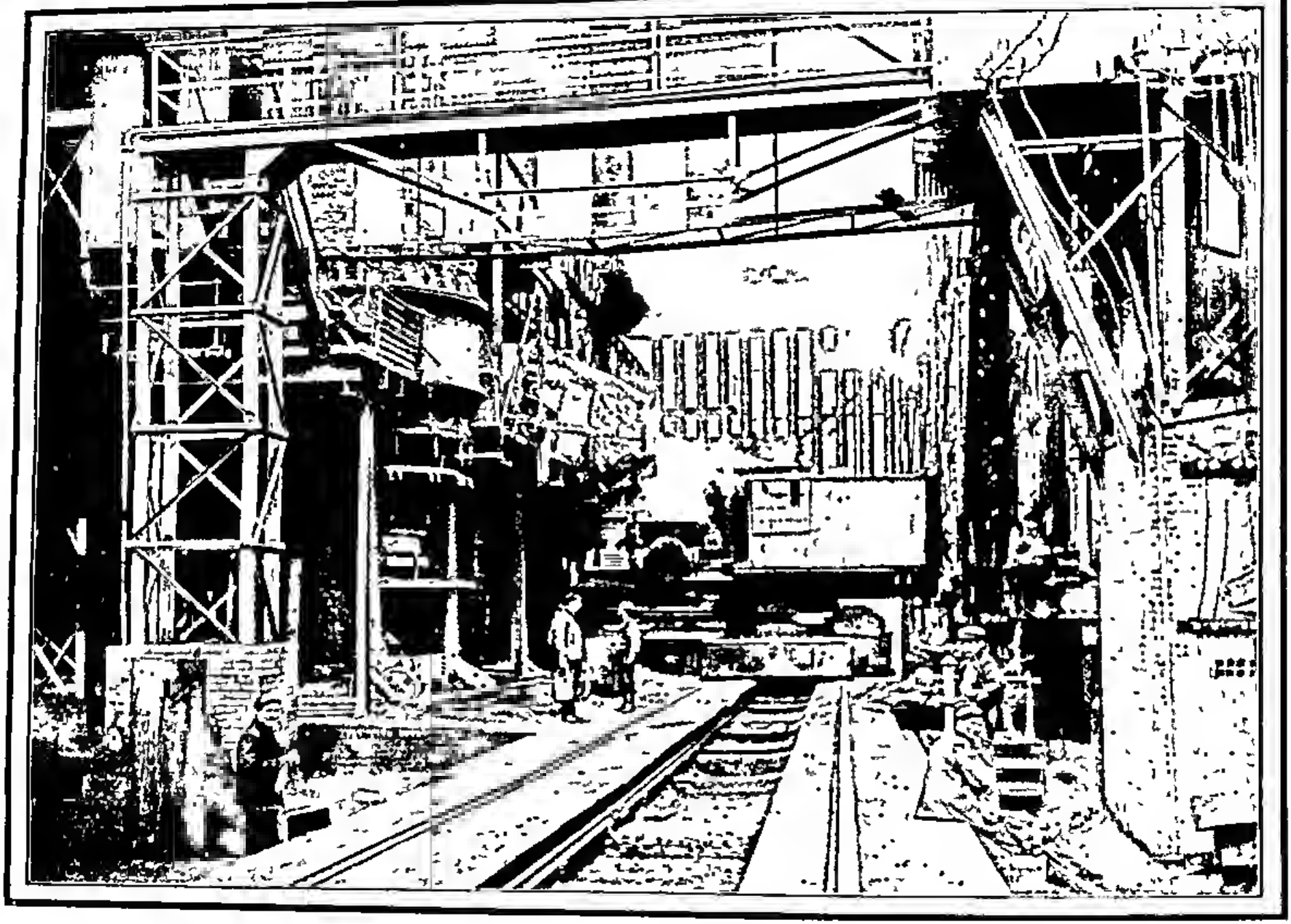
A FIRST NIGHT.

(By permission of "The Illustrated London News")

PHOTOGRAPH BY W. CROOKE

THE CHILDREN'S HOUR.

Bourne & Co.



PHOTOGRAPH BY PAWSON & BRAILSFORD

A BESSEMER CONVERTER.

ENTRANCE HALL,

Trocadero Restaurant, London, W.

(Courtesy of J. Lyons & Co.)

The Photochrom Co., Ltd.

"PROCESS" IN INDIA.

By H. HANDS.

FLOWER STUDY

Photograph and Design by FRANK W. ADAMS.

IF anyone gives the question a thought, he may imagine that there is a glorious field for a smart man of our craft in a country of three hundred millions of inhabitants. It may be so, but I should say that at present that man would be like one who owns a rich deep-level gold mine and who had only a hammer with which to work it. During the last twelve years I have seen the indications of several small tragedies. The advertisement columns of the Indian papers have been decorated (?) with badly printed blocks accompanied by a proclamation setting forth that "John Smith, photo-engraver, is *the* man for artistic process blocks." The imprint of the block is no recommendation of John Smith's abilities, and it gives one the notion that the machine man has tried to wipe up the impression with dirty rag. To the experienced eye it is plain that very poor ink (probably made on the premises with soot and oil), and a very soft and thick overlay are responsible for the poor result. But the advertisement appears, frequently at first, then at ever-lengthening intervals of time, to disappear altogether at the end of about a year. Poor John Smith has thrown up the sponge!

Let me, as one who has had a peep behind the wall of John Smith's shop, take you, you the camera man, the printer, the etcher, the mounter and the remainder of the party concerned in the production of a block in the shops of the good old homeland, let me take you to Smith's shop. Here he is at the camera, just finished an exposure.

"Good morning, rather warm," you say.

"What? 110° in the shade, did you say?"

"Runs to 130° in the dark-room? Nonsense, what about the development?"

You are still incredulous when told that artificial ice and chrome alum do the trick. But John has no time to waste on us. He sets another exposure going, looks at his watch and goes off to examine his print meter. One frame is full timed, he takes it in, rolls up the plate and puts it aside.

Ah, it is time to change the stop!

He has now one minute; just time enough to remove his last plate from the hypo and rinse it. Yes, he will do the "cutting" later on when he has a few more negatives to deal with. Meanwhile, his camera exposure finished, he takes one more look at his print meters and vanishes into the dark-room to develop.

L

No, you don't wish to go in with him; too warm! Well, we'll call later on in the day.

We find him—minus his shirt—planing up his blocks Warm work! Yes. Why doesn't he have a man to do this? None to be got, and if he trains a man a hundred to one *he will run off as soon as he has been taught enough to be useful!* How extraordinary! Poor John! You suppose his enthusiasm keeps him going, eh? Well, "Hope springs eternal" in most of us. In John's case it bubbles for a year and then dries up. The finishing stroke may come thus — A customer writes, "Sir, you make charge to me eight annas per inch; native gentleman in this place will charge me two annas." John replies, "My work is worth more than the stuff you can get at two annas—it is superior in quality" The customer returns to the attack "Sir, the printer make splodge on block, then what use superior quality? I not see difference in your block from that *of native man.*" *The fact is, there never was and never will be a field for the* blockmaker as such—he must also do the printing Even so, there is at present very little chance of making it pay. The publishers of the few illustrated papers there are do their own block making. One firm of publishers and printers do practically the whole of the small existing trade in illustrated catalogues and the government does all its own work. The man who *may* make a "scoop" will be he who starts in at colour work *when colour work can be turned out at a tenth its present cost.* Undoubtedly the native is fond of colour, and will probably be a good customer when the producer can fit his price to the millions, millions who, on the average, live upon the large sum of one anna (=one penny) per head per day. Rather a remote chaoce of making a fortune, you will say. Yet it is almost sure to happen that production will be vastly cheapened by the processes becoming almost wholly automatic.

SCOTS GREYS

Engraved by
NORTHERN ART REPRODUCTION CO., LTD

Photograph by
THOS. KENT

THE DEMANDS OF CAPITAL AND LABOUR.

By LOUIS FLADER,

Editor of the "Plate Makers' Criterion"

Design and Block by
THE I. C. C. SCHOOL OF PHOTO ENGRAVING

ORGANIZATION is the watch-word of the world at the present time, especially in industrial lines; both capital and labour carrying out its principles to a far degree. No one will deny that there are reasons for the existence of organizations of both Capital and Labour, though it must be admitted that in order to make either effective, and a medium of profit to its members, they must naturally become opposed to each other. The economic conditions of to-day are such that the possessor of capital is free to multiply his dollars in any manner that may prove expedient to himself, and the amount of money he can thus accumulate or control is unlimited. The working man, on the other hand, being the possessor of but one commodity (labour) is compelled to sell the same in competition with every other individual possessing and offering for sale a like commodity; and, consequently, is limited in his opportunities to earn even a living wage.

Capital is constantly demanding greater earnings upon the amount invested, regardless of the justice of such demands. Labour, wishing to keep body and soul together in a way befitting human beings of this age, is forced to fight for its very existence. To enable each class to satisfy its desires, as above mentioned, associations of employers and unions of working men have been organized.

The International Photo-Engravers' Union of North America was organized to improve the conditions of its members—the working men—by securing for them in common with other wage-workers, political independence; the right to sell their labour collectively, thereby to better advantage; the minimizing of petty bossism; shortening the hours of labour in keeping with the spirit of the times, and because of the harmful influences close confinement under ordinary shop environments has upon the health of the workers; and to establish a minimum wage scale, a sum calculated to remunerate a man for the length of time spent at extremely small wages to master the trade, being sufficiently large enough at the same time to enable him to live decently. In short, the working men by virtue of their union, are empowered to share in a more equitable manner the wealth *they alone* produce.

To secure these benefits the union must necessarily receive them from the public, through the medium of their employers. The public, as a rule, pays a price sufficiently large for the manufactured article to permit the granting of labour's request at the hands of the employers. If perforce of labour's request the price of an article is increased, the public always has and will pay it. This is witnessed by the fact that in the case of trust-controlled articles the prices are raised at the will of those in control, and are *always* paid by the public, the latter really having no choice in the matter.

The International Association of Photo-Engravers is organized for the purpose of increasing the income of its members. This is to be accomplished in two ways. Competition is to be eliminated by adopting a uniform scale of prices, higher than those now in vogue. In taking this action they bear witness to the assertion here made, that the public will pay the price asked of it The other method, and the one which it is thought will result favourably to their members, is to reduce wages sufficiently to increase profits in a perceivable manner. In short, according to their code of ethics, the benefits they desire are to be wrung chiefly from the working men.

A man possessing capital naturally wishes to add to his sum by investing it in a business that will prove at once safe and remunerative His money in *his hands alone* represents nothing. In other words, he must allow some one else the use of his money in order to receive earnings on it. He either lends his money to some one who has a use for it and who pays him interest for the privilege, or he invests it in equipment and tools, with which other men work, they in that case also paying him for the use of his money. Instead of these men (working men) paying him a sum intended as interest on the capital invested, he *hires* them at certain sums to work for him. It requires no great mental process to see at once that it is to his advantage to pay them as little as possible and thus greatly increase his profits. The state establishes a legal rate of interest for the use of money, but in business, especially manufacturing, there is no limit to the amount which a man may wring from his debtors, in other words, the working men. Both capital and labour are necessary for the carrying on of business in the manufacturing sense, and the question is: What may be considered a fair and just return to the man with his money invested, and also, what is a fair compensation to the man whose knowledge and ability as a craftsman, made the success of the business a possibility?

The argument is advanced that the photo-engraving business is on a non-paying basis; that is, the capital invested in it is not earning profits large enough to warrant its continued employment in that channel. If that is true, there must be a reason for such a condition. In that event a brief investigation will disclose the fact that a *third party* is receiving a share of the profits that it is not entitled to, namely, the public. By that is meant the manufactured articles are being sold too cheap, and the public is deriving a portion of the sum that *Capital and Labour alone* are entitled to.

These questions are argued in our circles on every hand. The association has struck the key-note when it asserts work is being sold too cheap. They are showing the right spirit when they attempt to adopt a higher scale of prices, in order that their profits may be increased thereby. But why stop there? Why are the prices increased to such amounts as to only *partly* secure for their members the amounts they desire? Why must the remainder of that sum be wrung from the working men?

To conclude, it may be said that if profits in the photo-engraving business are not large enough for those whose capital is invested therein, perhaps the most logical way in which these profits could be increased would be to secure them from the buying public. This method is also along the lines of least resistance.

The cause of prevailing low prices (paradoxical though it may seem) is the greed and avarice of the employers, coupled with ignorance of the business they are engaged in. To take away from the working men enough to increase the profits in a noticeable manner will, at best, have but a temporary effect, and will result in conditions likely to not only *further* reduce profits, but that will attack the capital itself.

VIEWS IN BUCKS.

T. B. Browne, Ltd.

Mapledurham Mill.

Church, Stratford-on-Avon.

PHOTOS BY MARTIN J. RIDLEY

Boldre Mill.

SOME VIEWS OF RUSTIC ENGLAND.

Harrand & Fuller.

FROM THE PAINTING BY JOSEPH DESIRE COURT.

ANTONY'S ORATION OVER THE DEAD BODY OF JULIUS CÆSAR.

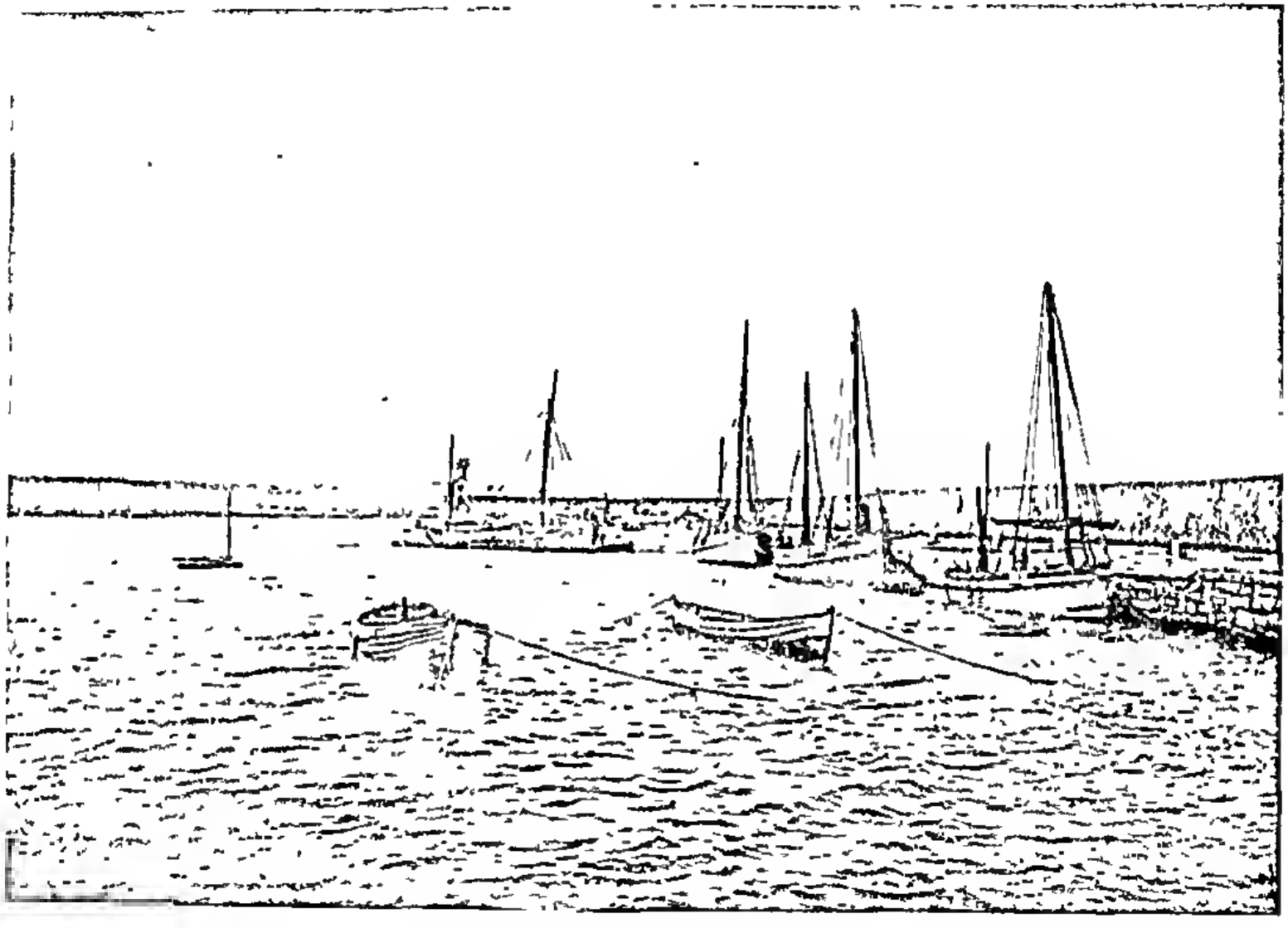
Reprinted from Harmsworth's "Self-Educator."

Photo-Engraving Department of Amalgamated Press, Ltd.

PHOTOGRAPH BY W. J. PAPPS

A BEAUTY SPOT.

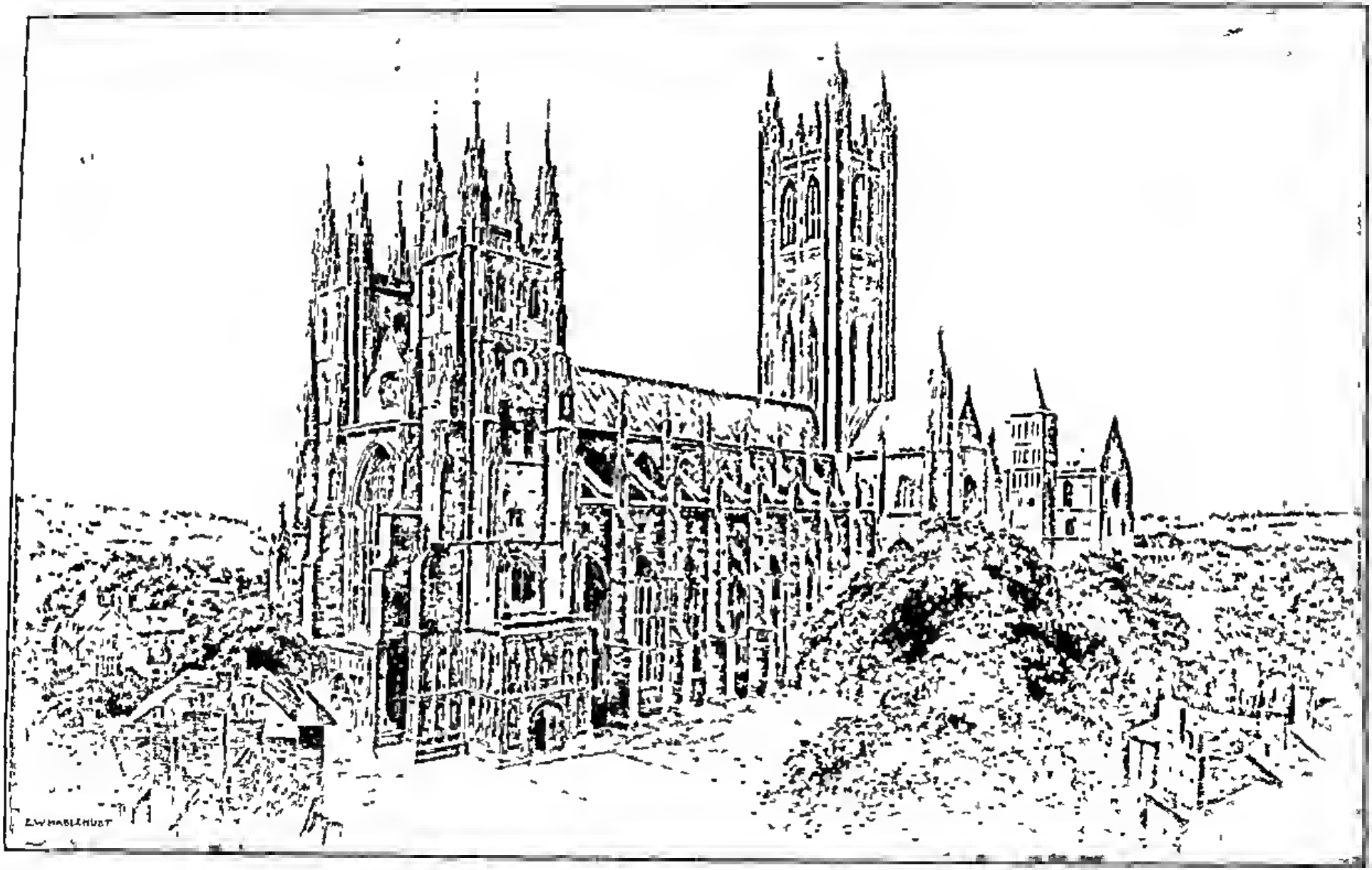
Near Maritzburg.



PHOTOGRAPH BY E. GEO. HAINES.

THE HARBOUR, SKERRIES.

Reliance Photo-Engraving Co.



CANTERBURY CATHEDRAL.

(By permission of "The Illustrated London News")

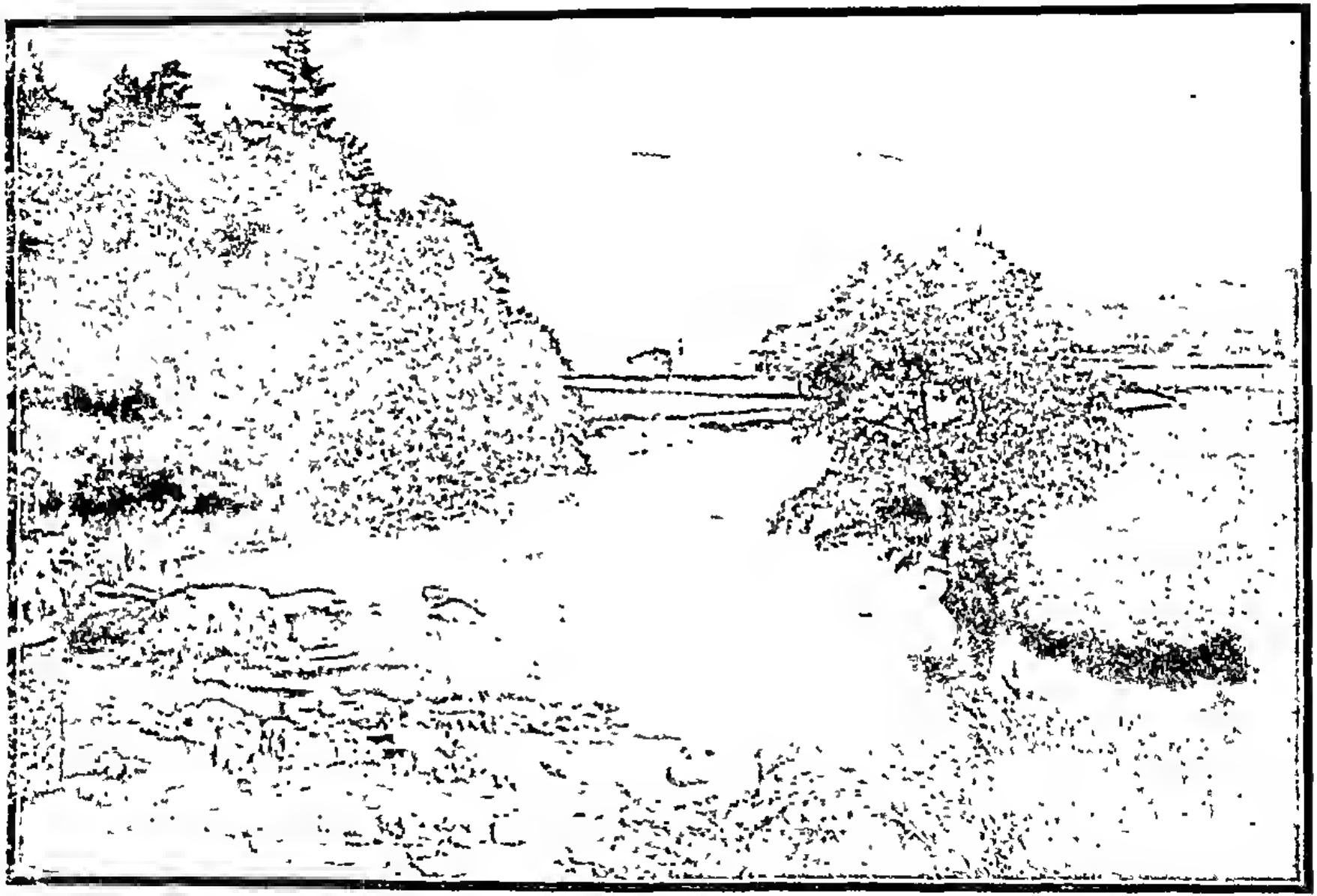
PHOTOGRAPH BY J. P. GLOVER.

THE SAXON CHURCH, BRADFORD-ON-AVON.

PHOTO. HALFTONE BY H. J. SPEET

IN TORWOOD.

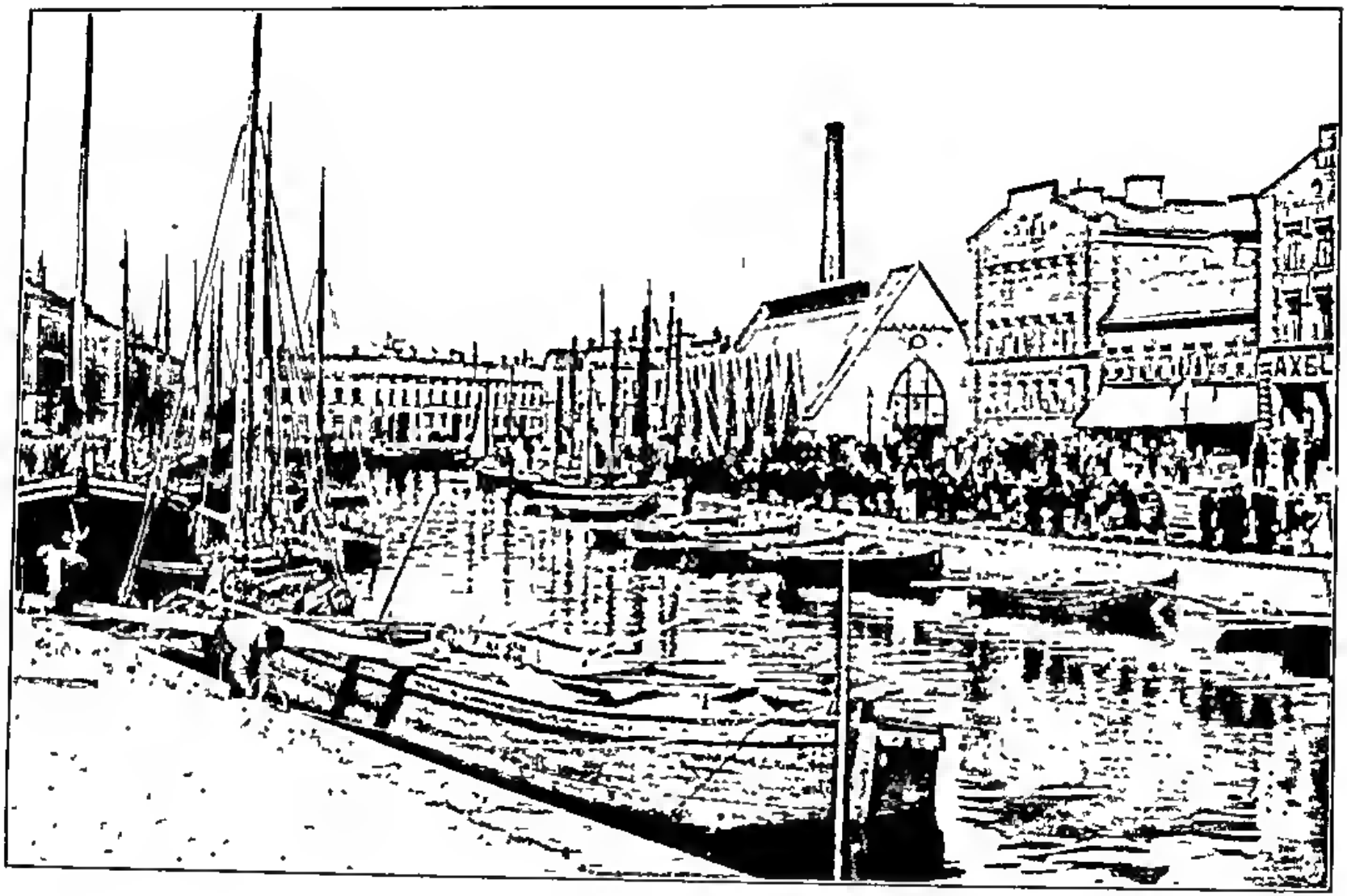
Glasgow Photo-Engraving Co.



PHOTOGRAPH BY C. S. BEST

LOCH TULLA.

Gilchrist Bros.



FISHMARKET IN GOTHENBURG.

Wald. Zachrisson.

A SWEDISH ACTRESS.

Wald. Zachrisson.

OBSERVATIONS ON EUROPEAN AND AMERICAN PROCESS WORK.

By HERMANN J. SCHMIDT.

EVEN OUR PUPPY SINGS "HIAWATHA"

Engraved by BOURNE & CO

Photographed by MARTIN J. RIPLEY

IN the Latin-speaking countries Process Engraving is done quite differently from that elsewhere. When I think of these people and their primitive methods I am inclined to take my hat off at the good results they attain. It is a very round-about way in which they do things, but they deserve credit. Take Spain for instance. I have only been in two shops where electric light is used, the others all depend on sunlight for their work. I will mention the names of some of the Spanish firms and these may be familiar to some of my readers. First, let us look at Barcelona, Spain's greatest industrial centre—the heart of Spain—with a population of about 700,000. There are J. Thomas, Juan Furnells, H. Enrich & Co., Montanar J. Simon, Emilo Bly, Liberia Typografica, J. Lavall, Juaristi, Bonnet, Louis Tarso. None of these are large firms; Furnells is the leading one, employing sixteen people. The others are larger, but they are printers or lithographers, and employ but three or four hands at block making. Barcelona is a pretty place, but one grows tired of it quickly. I was there six weeks, and was glad to get away. The place lacks rain, and there is little vegetation.

Every process firm in Spain do their printing on the metal without a printing frame. I do not care for such a method myself, but it will be interesting to describe how they do it. They use no substratum on their glass when negative making, they simply rubber the edges. When the negative is made and dried off, rubber cement is poured on and this is followed by a stripping solution which for their use is better than collodion. What they use is celluloid; it comes in large yellow sheets, is cut up fine, placed in a bottle and dissolved. Here is the formula:—

Celluloid	35 grammes.
Acetone	800 ccm.
Amyl acetate	200 ccm.

When dissolved it is filtered as collodion. After the negative is coated it is put into a warm oven, and it dries a little more slowly than our stripping collodion. It can be burned off to hasten drying; when dry the film is cut around with a knife as usual, and as it has no substratum underneath it leaves the glass support at once, whereas we have to soak the film in acetic acid and water. This film comes off nicely without any danger of tearing or stretching, and it certainly

seems a much safer way of handling a film than ours; besides it is tougher and more durable. Now the metal plate is coated, and the films are squeegeed down on to the metal as follows:—After the plate is dry, vaseline is rubbed all over the plate with a little rag and the film laid on, then a rubber squeegee which has vaseline on it also is rubbed over the films. You put down six to ten films in this way I have not seen any torn, they adhere quite firmly to the plate, and are flat, not curling up at all. Only in case you put it close to an electric light a corner or two occasionally curls or lifts, but, as I said before, no electric light is used, so the danger is avoided. Exposure is more rapid than if light had to penetrate the 1-inch plate glass of the printing frame and the ¼-inch glass support, so it is a case of "every little helps" When exposed the films are lifted gently off the plate and put on a paper, the vaseline is then removed by means of benzine and a rag or cotton, wiping off clean till all grease is removed If print is in fish glue, then it is put into water; if dry developing process, then powdered all over (the dry process is used extensively in Spain)

I find this method so much cleaner than the American way of printing large films on plates without a frame. In America we usually pour machine oil and castor oil on the plate, then put the film over this and squeegee down. This makes an awful mess. I did it myself often years ago on large jobs that had to be matched; the oil used to run all over my dark-room and down my sleeves, and we used alcohol to clean off the oil. So you see that one can learn things even in Spain, where you least expect to. The beauty of printing with films on the metal is shown at once when one beholds the wavy and bumpy zinc they get in Spain. I don't know where it comes from, but it is all hollows, ridges, knots and everything but flat. Of course, if such crooked metal were to be printed in frames it would be out of contact, but this way the film lies snugly into each hollow and over each hill so that you get a decent image on your metal. Zinc is used in Spain for all line work, and the rolling up method is used entirely. A few have mastered the American dragon's blood method. To say "mastered" seems a joke to me, as I find the rolling-up process very much more difficult than our way. To prove it I can refer you to Levy's powdering machine, which shows how simple it is. I am sure Levy could not make a machine that will roll up a plate ready for etching as they do in Europe. The American way is the easiest way by far, and the next time I go to Spain I expect to find them all using the dragon's blood system. Wages are very low in Spain, but things are very cheap as a rule. The men are quite as well preserved as ours are, they work very quietly and have much leisure and many holidays. They are somewhat indolent, are inveterate smokers, and love their bull fights, but when one considers the heat in Spain in summer no wonder they slow down a bit and enjoy their siestas. The same thing can be seen in the southern parts of the U.S.A.

I also went to Madrid, Spain's capital, and found several newspapers there which are now beginning to illustrate. Here are the names of the Madrid firms—"Blanco y Negro," "El Pais," "Los Successos," "Pablo Santa Maria," Sgr. Laporta, Hermanos, Jose Maria Mateu, Señor Ciaran, Eugenio Paez, Imprenta Alemana, "El Nuevo Mundo" These are all nice firms, using electric light as well as daylight, but have scarcely any machinery. Nearly all Spanish firms are, however, making great efforts to forge ahead, and at present great rivalry exists as to who can do the best and quickest work. If anyone has anything good he can dispose of it in Spain, as that country is just now waking up and realizing that all other nations are passing her commercially. Penrose & Co have an agent there now, an English gentleman, Mr. Frederick Shaw, No. 4 dup, Buen Sucesos; he is getting a lot of new business for them, and is a very

enthusiastic man. I spent some pleasant time with Mr. Shaw, and he rendered me some assistance, besides giving me information as to who is who and their financial rating. If you happen in Spain and cannot talk the language go and see him. There are a few more firms in Spain, but these I did not call on. I did all business by correspondence; here are the balance of names—Paul Burger, Bilbao; Jose Ortega, Valencia; F. M. Sanchez, Malaga; Pedro Ferrer, Coruna; Portabello, Zaragosa.

I was going to Portugal, but as Lisbon has only two small shops and they did not show any interest in new methods, I left it out; besides, it is very hard travelling in Spain and Portugal, trains are slow and lack accommodation and rates are very high indeed. Travelling in Italy and Spain also is a nightmare.

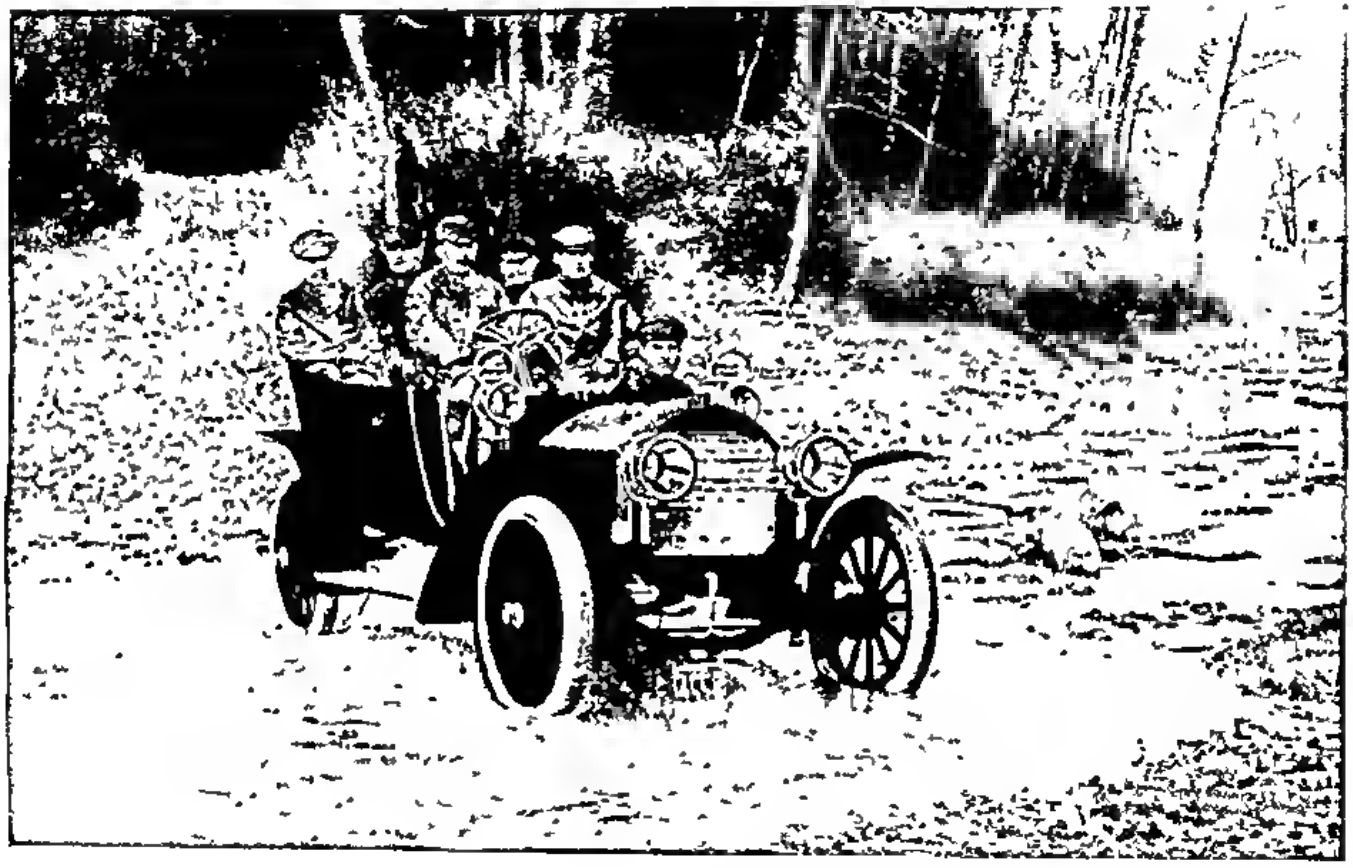
I travelled from Barcelona to Paris—the most beautiful of all European cities. I have previously described the French capital to readers of this ANNUAL, but I want to say that they work the same here as in Spain and Italy; no printing frames are used and, although their methods are not so rapid as ours, good work comes from France. Some of the finest stagers (fine etchers) I have ever seen are in Paris. In America we aim at a perfect original, no matter what it costs, then get a good negative, then a print on metal, and a good, deep etch without stopping out, after which the finisher gets it, puts in high-lights, burnishes a bit and there you are; but in France the copy is oftentimes poor; then the "stager," who is an artist, touches up a plate after a short etch, puts it into the etching bath, gives it a few rocks more and gives it another stage. He repeats this six or eight times. If leaves in foliage are weak the artist paints them in on the metal; wherever there is weakness he puts more strength into it. I like this European method of handling half-tones better than ours in America; the shadows are not very deep but the high-lights, where it needs be deep are as deep again as we get them in America, where the splendid ink, paper and AT presses score. I had American-made half-tones in Europe that they could not print with over there. In Europe a half-tone is often rolled up if the high-light is of vast area so as to get it extra deep. Parisian firms are here given. I may have missed a few mushroom firms, but these are all important houses:—H. Reymond, Cueille & Bouché, Chauvet, Leleu, Dumoulin, Gillot, Du Masin, Ste. Müllot, Bertin, Fernique, Simon, Roussett, Jean Gorget, Taton, Rückert, Victor Michel, Barrett, Tillier, J. Mauge, Grimmard, "Journal," "Petit Parisien," "Illustration," "New York Herald," "Le Matin," "Petit Journal," "Prieur & Dubois," Charaire, Decaux, Goupil, Serni, Merlet, Moriceau, Adolph Braun Cie. These I visited all myself, and the very best firms, as also the largest, are Reymond, Rückert, Gillot, Du Masin, Victor Michel and Adolph Braun. M. Braun does the reproductions of all famous paintings and pictures; it is an immense establishment with studios in Dornach, Germany, where all printing plates are made. Reymond is the largest firm in Paris, and is supposed to do the best work.

We will now see what we have in London and New York since 1900. London had seventy-one shops in 1900, and all I could count this year was forty-two, including the newspaper plants; the others have gone bankrupt or sold out to their larger competitors. Things in London were in an awfully poor shape, prices were such as to leave scarcely any profits. Up in the provincial towns half-tones were made for 2s. 6d. (half a crown, 65c.) Londoners were actually trying to compete with them, and when one considers the higher rents and wages of London he can guess where this will lead to. The result will be that five years from now there will be about twenty-five shops left, and these most likely will form an association.

What appeals to me about the London process engravers is this, there is such good feeling, such perfect harmony in the shops between men and boss, one has to see it to appreciate it; the engravers give their men an outing every year and often go to tea or some show all in a body, men, boss and all. The Englishman is a nice fellow to get along with, cool, thoughtful and faithful. I have not seen one in a temper. Johnny Bull is all right.

Let me close this article with a few words about the U.S.A. Well, I have just come home and find things about the same as when I left. Out west they have had some bitter times. Employers and employés have been flying at each other's throat, with the result that once one is on top, then the other fellow gets on top. All of Milwaukee and Detroit have now open shops, in other cities the Union is master. Many new shops have started out West, especially Seattle America needs more illustrations than any other country; wages are extremely good, with prices for the product going down New York has caught the English price-cutting fever. One of my former employers whom I worked for fourteen years ago, and who was then the best engraver in town, has changed his motto, from "Quality to Quantity." "Yes," he says "there is no money in good work any more, only cheap and quick work," and I saw him etch flat after flat of half-tones in one etch, and finished; he says it pays him better. On the other hand, the Walker Engraving Co. claim there is money in good half-tone and colour work; and they are doing an exceptionally good line of work. One of the hustling new firms that have just started and startled New Yorkers is the Zeese Wilkinson Co, who do only three and four-colour work, no line job or half-tone, and are so busy that they can scarcely turn out orders in time. They do not only the blocks, but printing as well. Mr. Wilkinson is from Holland, has worked all over Europe, and works a collodion emulsion of his own. I have seen their work and consider it the finest in America. They employ men from Europe and have European ideas all round. Collodion emulsion is dead here in the U.S.A., and no interest is shown in it. I have been at the Gill Engraving Co., and saw their powdering and etching machine (Levy's), in which I was very much interested. They both worked splendidly, and were turning out plates at a rate that was bewildering, and good plates too, mind. I have seen many etching machines in Europe, but it is the truth when I say Levy's is the very best. No European etching machine could compete with Levy's machine. If you have a lot of work and want it done accurately, get one by all means, but if you are only a small engraver you don't need one. The powdering machine is a beauty and so simple in operation.

In conclusion, I will say that I can see a great future in colour work, and workers ought to strive for perfection in that direction. Process engraving has been going downwards so far as prices are concerned, and to run a shop at present is a very risky proposition. Men are better off at their bench these days, as there is little glory in being boss just now. There is bound to be a move towards organizing in America and Europe, as prices are now ruinous. There will be a crash in London, Paris, Berlin, New York, and we shall see the little fellows dropping out. It is bound to come and is in reality on the way already. When you can get minimum line jobs for 25c. (one shilling), then it is time to call halt. I know of several New Yorkers who would like to sell their plant at a sacrifice. I know some who have left the business entirely, whilst others are going. At the same time it is best not to worry about these things, they may right themselves again It is all in the power of the "bosses" if they can get together and agree to some measures that will secure them better prices for their product.



A FLOODED ROAD.

Printed from Electrotypes

Gatchel & Manning.

THE ELECTRIC MOTOR IN THE HANDS OF THE PRINTER.

By GEORGE E. DUNTON (*New York*).

Design and Block by
THE L.C.C. SCHOOL OF PHOTO ENGRAVING

THE general adoption of the electric motor as a convenient source of motive power by the many lines of commercial industries, is due in the main to the convenient means which is afforded for the transmission and distribution of power to points of considerable distance, within, of course, reasonable limitations.

The convenience of electrically transmitted energy and the ever-ready and economic conversion of this energy to power through the medium of the electric motor, offers conditions and possibilities impossible to duplicate either by means of shafting and belts, or the transmission of steam through a medium of pipe lines.

The economic problem involved is still open to debate; but if the questions of convenience, cleanliness and safety are fully weighed against the one potent factor of evident cost, the decision will undoubtedly be in favour of electrical transmission and motor conversion of power.

The greatest handicap to the economic usage of the electric motor is the general public ignorance. First, in the selection of a machine of sufficient size or which will yield power adequate for the use to which the motor is to be put; and owing to keen competition of makers, allowing the customer to purchase a machine with the guarantee, that "it will stand from twenty-five to fifty per cent. overload." This may be figuratively true mechanically, but it is not literally so economically. It would be much better practice to advise the prospective purchaser not to load his motor to within ten to fifteen per cent. of its rated capacity. Second, in the lack of care in the maintenance of the motor.

Historically, mention of the first electric motor was made in 1823, in the form of a wheel-disc produced by Sturgeon; although a mere toy, it was the forerunner of Faraday's disc dynamo. This with the motor of Ritchie had no commutators, depending upon sliding contacts to reverse the polarity of the electrification. In line with these motors having sliding contacts, were inventions by Page, improved on by Bourbouze on the general lines of the old-fashioned

walking-beam steam engine, embodying the crank, beam, fly-wheel, connecting-rod and even copying eccentric slide-valve gearing.

Jacoby's motor, produced in 1838, was the forerunner of the present type, having the rotating armature and commutator The first motor-propelled boat was driven by Jacoby's motor, using 128 Grove elements as a source of power. The trial is said to have been made on the river Neva, under the patronage of the then Emperor Nicholas, and the boat, carrying twelve persons, travelled about two and a-half miles per hour.

The next motor of importance was that of Elias, constructed in 1842 Its significance was, in the inventor's anticipation, of the ring type armature, by winding his wire continuously around the periphery of a solid, continuous iron ring which rotated within a second ring; the field, also wound with wire and having pole pieces Elias's machine could almost be considered a prototype of the idea embodied in the present type of the multipolar motor. In the same year Davidson produced an electric motor of such efficiency that he was enabled to propel a carriage between Edinburgh and Glasgow, at the rate of four miles an hour Unfortunately we are unable to secure any description of Davidson's motor or motor-carriage

The two most important advances between this time, 1842 and 1871, at which time began the real development of the electric motor, were first in 1855, when came the invention of the shuttle armature of Dr. Siemens, which was the suggestion of the drum armature, and 1864, when Pacinotti produced the toothed ring armature core This idea is incorporated at the present day in all the slotted armature cores, having the armature wires wound in the slots of the armature core and below or inside the periphery of the core.

All the earlier attempts to use the electric motor commercially were fruitless, mainly because there was no economic means of producing electrical energy, the only available source of supply being the voltaic cell, which was not only a very expensive but an inefficient generator. The production of electrical energy, by the "burning" of zinc in sulphuric acid, is fully twenty-five times greater in first cost of zinc alone, while the energy produced is only about one-sixth that delivered by the combustion of coal.

With the introduction of the Gramme dynamo in 1871, came the economic source of electrical energy with which to run the motor, and it did not require long for the engineers to realize that the necessary power could be transmitted by means of "wires," and that one of the machines could be used as a generator while the other would run as a motor, or that machines which were built on the same general lines could be used either to develop, or utilize the energy developed.

The electric motor may well be compared to the turbine steam engine, having both the fixed and rotating parts and having connection with the source of motive energy While the engine has one connection with the source of energy, a pipe connecting with the steam boiler or generator, the motor has two wires, one leading the energy from the source to the motor, and one leading from the motor back to the source of supply, making what is termed a continuous circuit.

The motor is in matter of fact an electrically operated magnetic engine. In theory it is an electro-magnetic converter or rotary power transformer, in or through the medium of which electrical energy may be changed or transformed into a resulting mechanical energy manifest by the turning of a shaft, which may be further manipulated or made use of by the use of pulleys and belts or gears.

The motor of the present consists of two parts, one of which, termed the field magnet, is fixed or stationary, while the armature, which is another magnet, is pivoted on a shaft and free to revolve or rotate around its axis, the shaft. In

its operation the motor depends first and fundamentally upon the so-called "first law of magnetism," which, concisely stated, is "like magnetic poles repel one another; unlike poles attract one another." Secondly, the available power of the motor or its capacity to do work depends upon the second "law of magnetism." "The force exerted between two magnetic poles is proportional to the product of their strengths, and is inversely proportional to the square of the distance between them, provided that the distance is so great that the poles may be regarded as mere points." This is not literally true, then, with the motor, as the poles present a considerable magnetized surface, but it does hold good in a given ratio to the square of the distance. Consequently the nearer we can present the core of the armature to the surfaces of the poles piece, within mechanical safety, the more powerful will be the motor, of course, keeping in mind the magnetic strength and a second factor which will be later explained

To better comprehend the operation of the electric motor, let us presume the experiment with a horse-shoe magnet and a pocket compass. Placing the compass between the poles of the magnet, note that the needle of the compass swings round in a plane with the ends of the limbs of the magnet, with the end of the needle which points to the north pointing to the leg of the magnet marked "N." If we carry the needle half round on its axis and release it, it immediately turns back to its original position, or if we should turn the horse-shoe over, changing the relative position of the limbs, the needle will immedately reverse its position. Now if we could provide means to constantly change the polarity of the compass needle, just before its poles swing into the plane parallel to the axis of the poles of the horse-shoe, then we should obtain a continual rotary motion to the compass needle as we do the armature of the motor. While in the motor the two magnets, the field and the armature, assume polar relations in obedience to the first law of magnetism. The "S" pole of the armature will swing round in line with and next to the "N" pole of the field magnet, and if the core of the armature was a permanent magnet having fixed poles, when these poles were in a plane parallel with the axis of the polar extremities of the field magnet, with the opposing poles in juxtaposition, then the armature magnet would be held firmly in this position, refusing to turn further after coming to a state of rest. For this reason the armature of the motor must have a magnet core which can be highly magnetized and as readily demagnetized, or lose all but a very small fraction of its magnetism. So far as the physical laws of operation go, the field magnet might be a permanent magnet, but the motor would not be nearly as efficient as with the electro or electrically excited magnets.

It is necessary then, in the operation of the electric motor, to provide means that will excite opposite, consequent poles in the core of the armature; also to prevent the axis of polarity of this armature core from reaching a line or position parallel to the axis of the poles of the field magnet It is the force exerted between the opposite poles of the armature core and those of the field magnet in the effort to establish a state of equilibrium, or to bring the opposite poles in the same equal plane; and providing means of preventing this condition from transpiring, by constantly altering the polarity of the armature core that causes the armature to turn or revolve upon its shaft. This changing the polarity of the armature core is termed commutation, and is manuiplated by the position of the brushes upon the commutator, which is really only the connection and contact between the ends of the armature wires, and the brushes are merely sliding (or fixed) contacts which the commutator revolves freely between, and which in turn can be swung round through a cycle of limited range, thus altering or changing the position of commutation.

It is time-honoured to speak of changing the polarity of the armature, but in matter of fact the relative points or regions of polarity of the armature are and remain fixed, while the armature turns away from these points as the influence of the field magnets endeavours to pull them around the axis on which the armature revolves or turns; and in so doing keeps the armature rotating around its axis or revolving.

The action of this magnetic force on the armature core is called the torque of the motor. Torque may be described as that action of force or forces which produces or tends to produce torsion (around an axis), the twisting force applied to turn a shaft. The power of the motor depends upon the value of this twisting force or the force tending to pull the armature core around until its poles are in a plane with those of opposing polarity of the field magnet, and a state of magnetic equilibrium established.

The torque is equal to the force (magnetic) multiplied by the perpendicular distance through which it acts. The power of the motor is equal to the torque multiplied by the speed.

We have very briefly treated the magnetic part of the motor which is dependent wholly upon the electrical part for usefulness and efficiency The economy and efficiency of the motor as a converter of power, depends upon its winding and distribution of wire.

A motor will run with electrical energy supplied to its armature alone, by inducing consequent poles in the polar extremities of the field magnet and turning to set its core in the same plane with their common axis. Operation by such a method of induction is not practical, both on account of the susceptibility of the field magnets to the perturbations of the armature, also to destructive sparking of the brushes and commutator.

There are three vitally important considerations in winding the wire on the motor (fields and armature). The field magnets must be made very powerful in proportion to the armature. There shall be as little heat waste as possible, and the counter-electro-motive-force generated in the armature shall be as high in relation to the energy operating the motor as practical or possible. The speed at which the armature turns should be as great as practical and within limits of mechanical safety for two reasons. As stated, the power of the motor depends upon the twisting force applied to turn the shaft multiplied by the speed at which the shaft turns or its velocity. We are also able to increase the leverage of the shaft, so to speak, by causing it to turn faster; putting on a smaller pulley on the motor shaft or a larger one on the press or driving from a smaller gear on the armature to a larger one on the press. By being geared in this manner the armature does much less work per revolution than its maximum rate, but it will be more efficient, as there will be less electrical energy expended, and the ratio of useful work done to the energy expended will be nearer unity than with the slower armature speed. The economy of the motor as a converter of electrical energy to mechanical, depends on the speed at which we can run the armature and the ratio of decrease of this maximum speed under full load. It is a commonly accepted physical law that "every action is accompanied by a corresponding reaction," this fact is of vital importance in the operation of the electric motor. The velocity with which the electrical energy acts through the medium of the armature wires is the principal governing factor of the speed of the armature, but if the armature should draw a current equal in quantity to the carrying capacity or the armature conductors at the full voltage of the exciting generator, it would be a very extravagant machine to operate. In fact, we could not operate it on account of the excessive heat this current would produce in the conductors,

SECRETS.

Printed from Electrotypes

Gatchel & Manning.

unless we interpose some resistance in the circuit to protect the wires or their insulation from destruction.

Returning to the fact of the "action followed by the reaction." The electrical energy acting through the medium of the armature wires creates a powerful electro-magnet in the core of the armature, as has been earlier stated. These wires are travelling or rotating in the gap between the armature core and the pole piece within a very strong magnetic field. The consequence is that these conductors are acted on by the magnetic force which they develop in the armature core, and in turn develop electrical energy acting in the opposite direction to the energy which excites the armature. This opposing force is called the counter-electro-motive-force, and is of the utmost importance in considering the action of the motor, because upon its existence and magnitude depends the degree to which any given motor enables us to utilize the energy that is supplied to it in the form, or through the medium of electricity. In fact, this counter electro-motive-force is an absolute and necessary factor in the power of the motor, just as much as the velocity with which the exciting energy acts, to which it is proportional.

No motor ever succeeded in turning or converting into useful work the whole of the electrical energy which fed it, for it is impossible to construct machines devoid of resistance, and whenever resistance is offered to energy, part of the energy in proportion to its velocity is wasted, in the case of electrical energy, in heating the wires or whatever offers the resistance. A motor which in running without its load generates only a low electro-motive-force cannot, however well designed, be an efficient motor when supplied with energy at a high electro-motive force or *vice versa*. They must be supplied with electrical energy at velocities adapted to them. Even if a perfect motor could be built (one without friction or resistance of any kind) it would not give an economical or efficient result, if the laws of efficiency were not observed in the conditions under which the electrical energy was supplied to it.

Motors having an efficiency of ninety per cent. are considered in practice excellent machines. Many persons at the present day are of the opinion, erroneously though, that the best motor will not convert over fifty per cent. of the electrical energy supplied to it at the terminals, to mechanical energy at the motor pulley. The motor which receives electrical energy at a pressure of 220 volts, and generates a counter electro-motive-force in its armature of 198 volts, would have an efficiency of ninety per cent. as a converter of electrical energy to mechanical.

It is not economy to overload the motor in the smallest degree, for the moment that we impose conditions which tend to decrease the speed of the armature too far from its maximum, we cut down its counter electro-motive-force, opening the armature coils to an inrush of current inversely proportional to the decrease of the counter electro-motive-force maintaining during the period of overload, provided that the electro-motive-force is kept at a maximum. The result will be an excessive heating of the armature wires and an abnormal cost of energy.

Motors built at the present day (the majority) are so well designed that they will carry up to quite their full load with only a very slight variation in the armature speed, some not over two to three per cent. Such machines are truly "self-regulating." By "self-regulation" is meant that the armature does not run at an excessive speed or race when the load is taken off, and which maintains nearly a maximum speed up to the point of full load. No doubt the shunt-wound motor is the most practical self-regulating machine for general usage, because of its divided circuit, the shunt field coil and the armature coils receiving energy independent

letters for the binding screws, common to the manufacturers, "*L*" signifying line, "*A*" armature, and "*S F*" shunt field, or, in the case of the common shunt motor, simply field. In the drawing, what is actually on the outside of the box is drawn in full line, while those parts and connections inside of the box are represented by dotted lines.

The binding screw *L* is connected with the stud *G*, which carries a swinging arm *H*, governed by a coil spring *n*, with its energy counter-clockwise, is moved

DIAGRAM 1

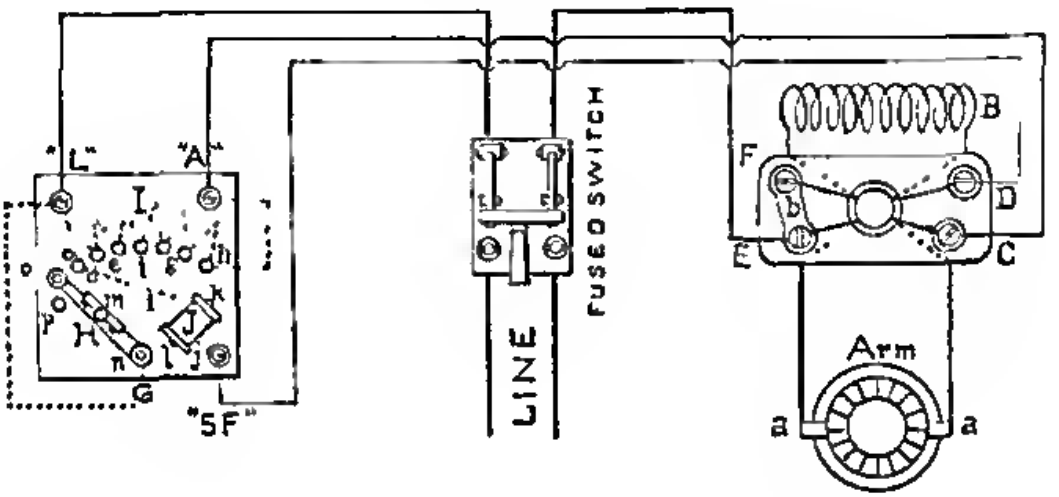


Fig1 Fig2

DIAGRAM 2

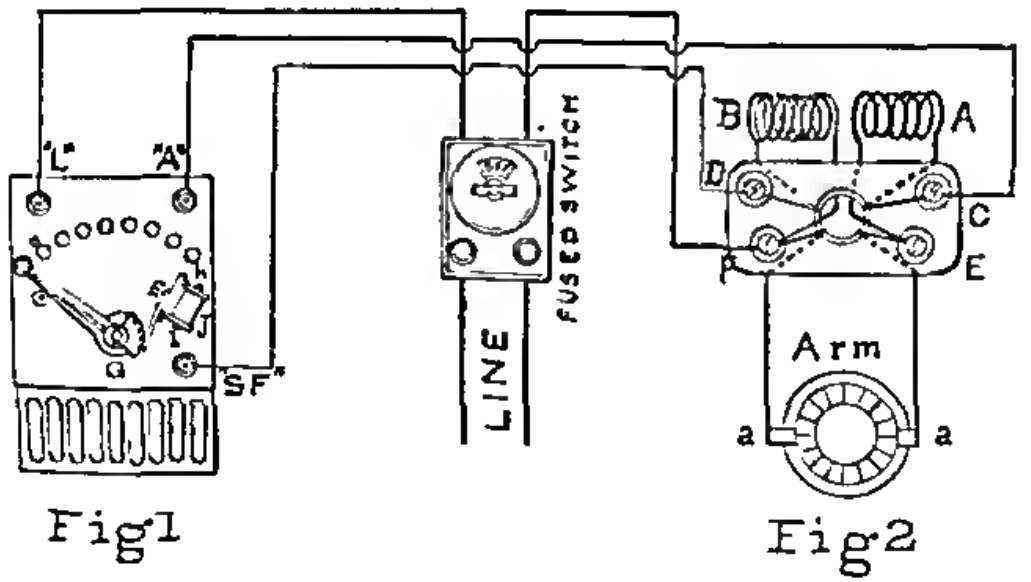


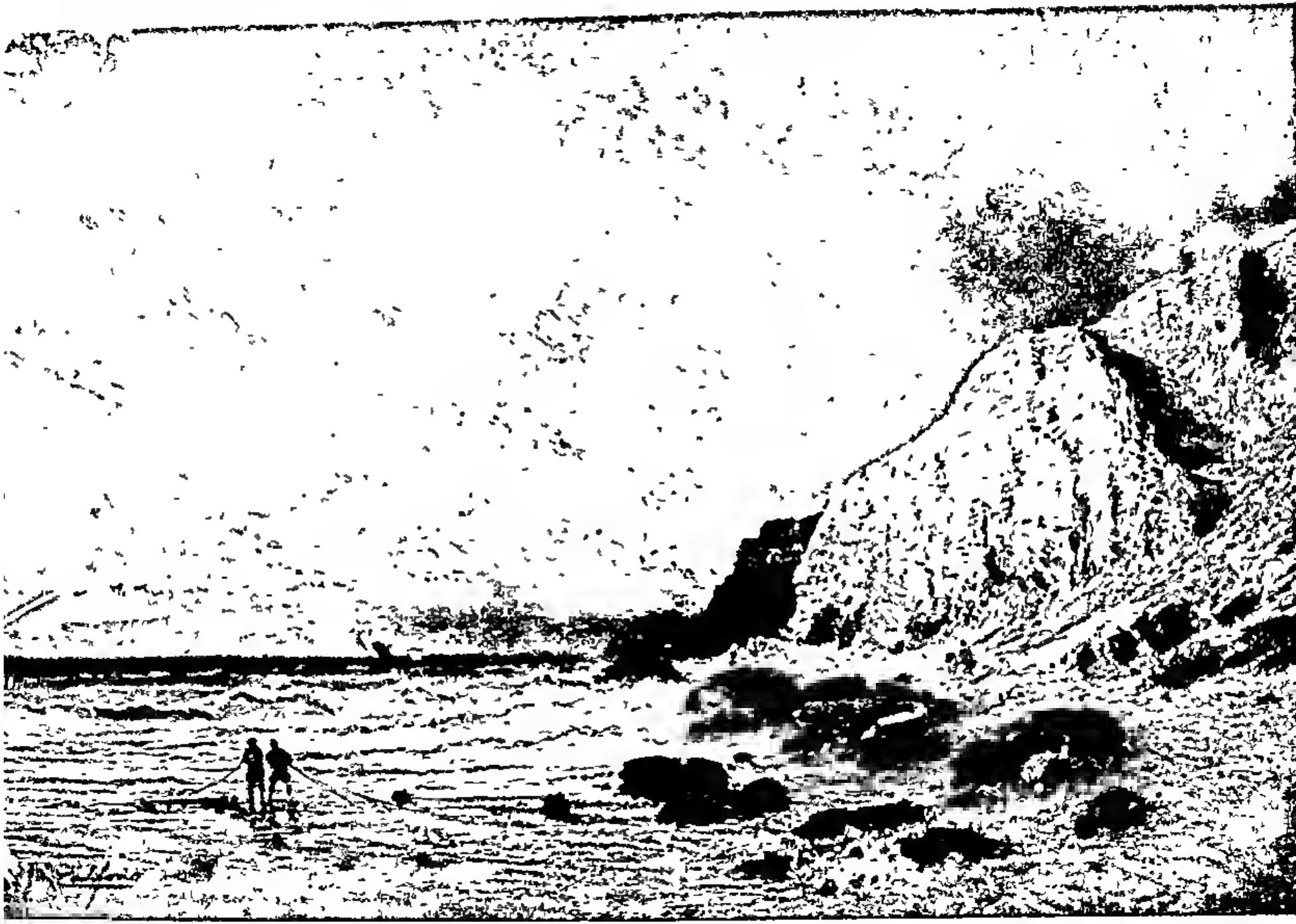
Fig1 Fig2

by the handle *o*, over the contact points or buttons *d*, *e*, *f*, *g*, *h*, when an armature *m* comes in contact with the pole pieces *k*, *l*, of a magnet *J* holding the arm *H* as long as the circuit is complete or as the current is active in the circuit.

The buttons *d*, *e*, *f*, *g*, *h*, represent the ends of coils or spirals of German silver wire, of wire of high resistance, connected through the last button *h*, with the binding screw *A*, at the top of the starting box. This binding screw connects

From a Water Colour Drawing by A. J. Gough

FIRST IN THE FIELD.



with the armature of the motor. The object of these coils is evident, their high resistance absorbs the energy of the current, giving the armature time to come to speed before it receives its full current, when, owing to its counter-electromotive force, it is able to hold it in check.

With the lever resting on the last button *h*, the current passes directly from the binding post *I*., through the arm to the binding post *A*, and thus on to the armature of the motor without further obstruction. While these coils of resistance are tbus cut out of the armature circuit they are of further service, being automatically switched into the shunt circuit. As we have stated, the current divides really at the button *h*, in the starting box, between the shunt and armature circuits of the motor. It does, for when the arm *H* is resting on the button *h*, there are two paths for the current, one through the binding screw *A*, directly to the armature of the motor and one back through the resistance coils of the starting box conversely connecting with the buttons *g*, *f*, *e*, *d*, which is connected by the wire *i* to the magnet coil *J*, and by the wire *j* to the binding screw "*S F*," which is connected directly with the field coil of the motor. The resistance now serves to protect the magnet coil on the starting box.

A modification of this starting box, called a speed regulating rheostat, consists of more coils, and instead of the armature *m* being directly connected to the arm *H*, it works on an independent stud placed near the coil *J*, holding the arm *H*, on any of the buttons desired by a projecting dog, which engages tbe arm in little slots cut at its lower side around the axis *G*. Part of the resistance is in tbe armature circuit and part in the shunt field, depending upon the speed at which it is desired to have tbe armature turn. It will be only necessary to add that tbe more resistance placed in tbe armature circuit the slower the armature will run, because this external resistance will not permit it to generate its maximum electro-motive-force. It is, therefore, not economical to run motors this way only for sbort periods of time.

In the second diagram a compound motor is graphically shown. After consideration of diagram 1, it will be unnecessary to explain that the current binding screw *A*, on the starting box, is connected directly to the armature by the binding screw *C*, on the motor through the armature to the binding screw *E*, but instead of *E* being connected directly with the line as with the shunt motor it connects with the series coil which in turn connects with the binding screw *F*, to which also connects the end of the shunt coil, and both connect directly with the line, returning to the generator. The connections of the shunt coil as to the intake of current remain the same, but where the two circuits join upon leaving the motor instead of joining with the armature the shunt and the series coils join.

Contrary to a popular belief that a motor once properly installed needs no *further attention, they need constant careful attention. The bearings* need regular oiling, not only at such periods as they "fairly scream" for want of oil, but a small quantity regularly, every Monday morning, say. Around the end of the commutator, where the brush holders are insulated from the rocker arm, and any other parts where it is only a short space between exposed conductors (carrying current) and the iron of the machine frame, should be carefully wiped often to removed dust and oil. Do not allow the brushes to spark, an oiled pad touched to the commutator occasionally and the sparing use of sand paper (fine) are good practices. Watch the controller arm on the starting box, see that it releases every time the motor is stopped. Remember, "Cleanliness is next to Godliness," and care prevents repair.

The ills to which the motor is inherent are few. The greatest cause for trouble with the motor is abuse, which includes neglect.

When the armature starts and before reaching full speed, either flashes and blows the fuses, or blows the fuses without a flash, you may feel sure that there is a "ground" or a cross connection between the inner and outer coils or layers of wires on the armature which connects the two halves of the winding The only remedy is rewinding the armature. This cross connection may not go to the core of the armature, consequently the magneto will not show anything, unless the end of all the coils are disconnected from the commutator and tested out with their neighbours, when the trouble will become apparent.

When two or more neighbouring coils are crossed the armature will turn very slowly and spasmodically; this symptom is called "creeping." There is seldom any help excepting rewinding, unless the coils can each be removed without disturbing others. But armatures in which the coils are independent of each other like the Gramme ring type, are not subject to this trouble It is usually the drum armature that is afflicted with these two trouhles, armatures in which it is impossible to remove the under layers or bottom coils without stripping the entire armature of its wire

An armature which is grounded to the core will run sometime, unless another ground develops somewhere in the circuit, then there is trouble at once. Generally the current will jump the insulation at the end of the commutator unless the distance is too great.

Sparking at the brushes usually denotes a wrong lead, or an overload. A negative lead will cause excessive sparking at the brushes. The spark is reddish and snappy. Reddish sparks which follow the commutator round, increasing to a bright glow and gradually dying away again, denote poor insulation between the commutator bars. A pinkish blue spark following the commutator round denotes an open coil in the armature, and it can be detected, its location, by the destruction of the insulation between the two bars and the blackening and eating away of the edges of the bar connected to the broken coil and its neighbour, following in rotation. A temporary relief is to solder the two bars together.

There is very seldom any trouble with the field coils: if there is, it is apparent in the magnet coil on the starting box. Sometimes this coil is also affected by dwelling too long on the buttons in starting the motor, though the result is generally apparent in the resistance coils. These coils often break after excessive heating simply from torsion in coding. The wires can be spliced and soldered.

Whenever there is trouble with your motor, first open the main switch, slip pieces of card or other insulation under both brushes, then with the magneto try first the armature for a "ground," then the field, disconnect the brush holders from the terminal block and test them out with the rocker arm, then try the starting box. Every time a fuse blows, unless you are satisfied as to the cause, test the motor as stated for a "ground," and if there is none shows, rest assured there is internal trouble with the armature.

ELECTRO DEPOSITED STEEL.

By A. E. BAWTREE.

Block by
Reproductie Compagnie,
Rotterdam, Holland

OF the nature and possibilities of deposited steel the average printer seems wonderfully ignorant, wonderfully because its uses in his business are so great. The very largest firms, of course, steel-face some of their plates and blocks, but it is probably no exaggeration to say that oot one small printer in one hundred makes use of the process. The half-tone on a draper's catalogue may only get 5000 runs at each edition, but if you get repeat orders every six months you will soon wear out the block. Those repeat orders are more likely to come along, too, if you print from a plate kept always fresh and bright with a coat of steel than if the impressions are taken from one of soft copper, with the high-light dots worn down almost to nothingness.

What, then, is this steel deposition and how is it worked? It is generally called, among those who work it, "Steel-Facing," because its most general application consists of facing a soft copper or lead alloy plate with a thin film of steel, which, by its great hardness, greatly prolongs the life of the surface on the machine. To give some idea of the advantages of steel-facing, an engraved copper plate, such as a photogravure, which would show signs of wear after fifty impressions from the bare metal, should run from five to ten thousand with this wonderful protecting covering. Half-tone blocks, too, printed on a colour machine under pressure that splits solid metal mounts, will yield from two to three hundred thousand copies with one face, and when re-faced are as good as new. Rotary stereos, used for the production of the enormous runs of patent medicine advertisements, will yield a full million copies when steel-faced upoo a slight previous coating of copper.

Reference was just made to re-facing, and this introduces another advantage possessed by the process, namely, that as soon as a face shows signs of wearing through, exposing the red copper in patches through the white outer surface, it can be dissolved away and a fresh ooe applied, rendering the printing surface as good as new.

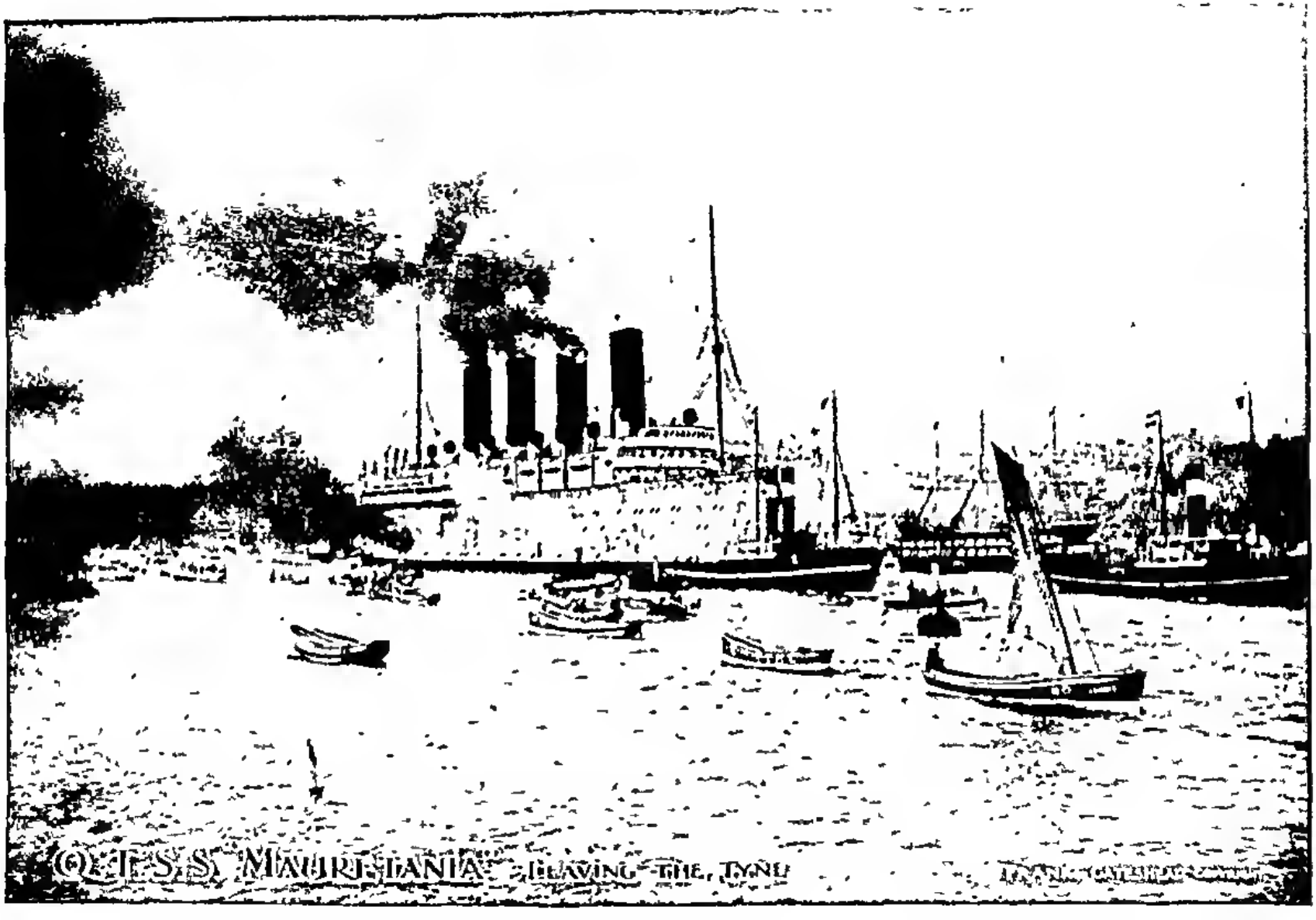
The steel-facing process, as we know it at the present day, was invented by a Frenchman, Henry Garnier, uoder whose instructions a patent was taken out (No. 667) in 1858 by E. A. Jacquin. This patent was sold in 1860 to, and for many years held as a monopoly by, Messrs. Virtue and Messrs. Bradbury, Wilkinson & Co. The latter firm still claim to be the finest operators of the process in the world, a claim which is at any rate reasonable if *experientia docet*.

So admirably drawn up is this patent specification, that it fully describes the process as practised at the present time. Those who are interested in the matter will do well to procure a copy, which they can do for the sum of 8d. through any money order office at a day or two's notice. The preparation of the solution as there described is as follows:—Dissolve 100 lb. of ammonium chloride (Sal-ammoniac) in 1000 lb., *i.e.*, 100 gallons of water. In this hang two iron plates, one as large as the vat will take, the other about one-quarter the size Pass a strong electric current through the solution, connecting the large plate to the positive side of the current and the small one to the negative The current, where power is not available, can be derived from five large Bunsen cells in series, renewing the acid in the cells as soon as the current is found to be dying down. After about forty-eight hours the solution will be ready for use. To steel-face a plate in this bath, solder a wire on to the back to suspend it by and boil it for ten minutes in a 10 per cent. solution of caustic soda. Then scrub it with a soft brush with a paste of whitening, moistened with a 5 per cent. solution of potassium cyanide. Scrub every trace of this paste away under a good flow of water and hang at once in the depositing solution, with the current supply turned on. If the vat is in good working order, the plate should become covered in about thirty seconds with a beautiful silvery deposit of electrolytic iron. It is a mistake to call it steel, if by that is understood an alloy of iron and carbon. The coating owes its great hardness partly to occluded hydrogen, but mainly to its close crystalline structure. In about ten minutes the silvery lustre will begin to die down, giving place to a slatey grey. Here comes in a tip not discovered at the time of the patent. Lay the plate on a clean bench in the sink and scrub the surface with a stiff brush and fine emery powder till the full lustre of the steel is restored, and hang again in the vat. Three or four thicknesses of steel can be built up in this way, adding greatly to the durability of the printing surface. When the desired amount of iron has been deposited, wash the plate thoroughly in an abundance of water and dry rapidly with clean absorbant rags. Finally, rub over with a little oil to prevent rusting from a stray drop of moisture.

To remove a worn-out steel face, boil the plate and scrub with whitening paste as already described. Rinse well and brush over with a 10 per cent. solution of nitric acid till every trace of the old face has disappeared. Repeat the boiling and scrubbing, and the plate can be hung in the depositing vat to receive a fresh facing.

A desire has frequently been expressed for some means for obtaining thick deposits of steel, though it is doubtful whether such a process would possess any great utility. The author has, however, obtained from an eminent Russian electro-chemist details of a process which, in the writer's hands, has yielded excellent solid steel electros $\frac{1}{32}$ of an inch thick. Like many other good inventions, it is very simple. To one of the well-known steel-depositing baths is added a small proportion of sodium carbonate, and the thing is done. A thick plate deposited by this method is so malleable that it can be bent sharply double and flattened out again without cracking. Printing plates can be deposited in this way to a thickness of a thirty-second of an inch, and then built up with copper to any desired substance where speed is required, as the iron takes rather longer to deposit than copper.

In conclusion, the author's advice to many a small printer is, "try your hand at steel-facing some of your plates. The outlay on the plant is small, and, in addition to the advantages already enumerated, you will find that many of your colours will print the brighter from plates that have received a coating of electro-deposited steel.



By Permission of Frank & Sons, Photographers, Newcastle.

Hood & Co., Ltd.

PHOTOGRAPH BY REINHOLD THIELE

PHOTOGRAPH BY JAS. E. TYLER

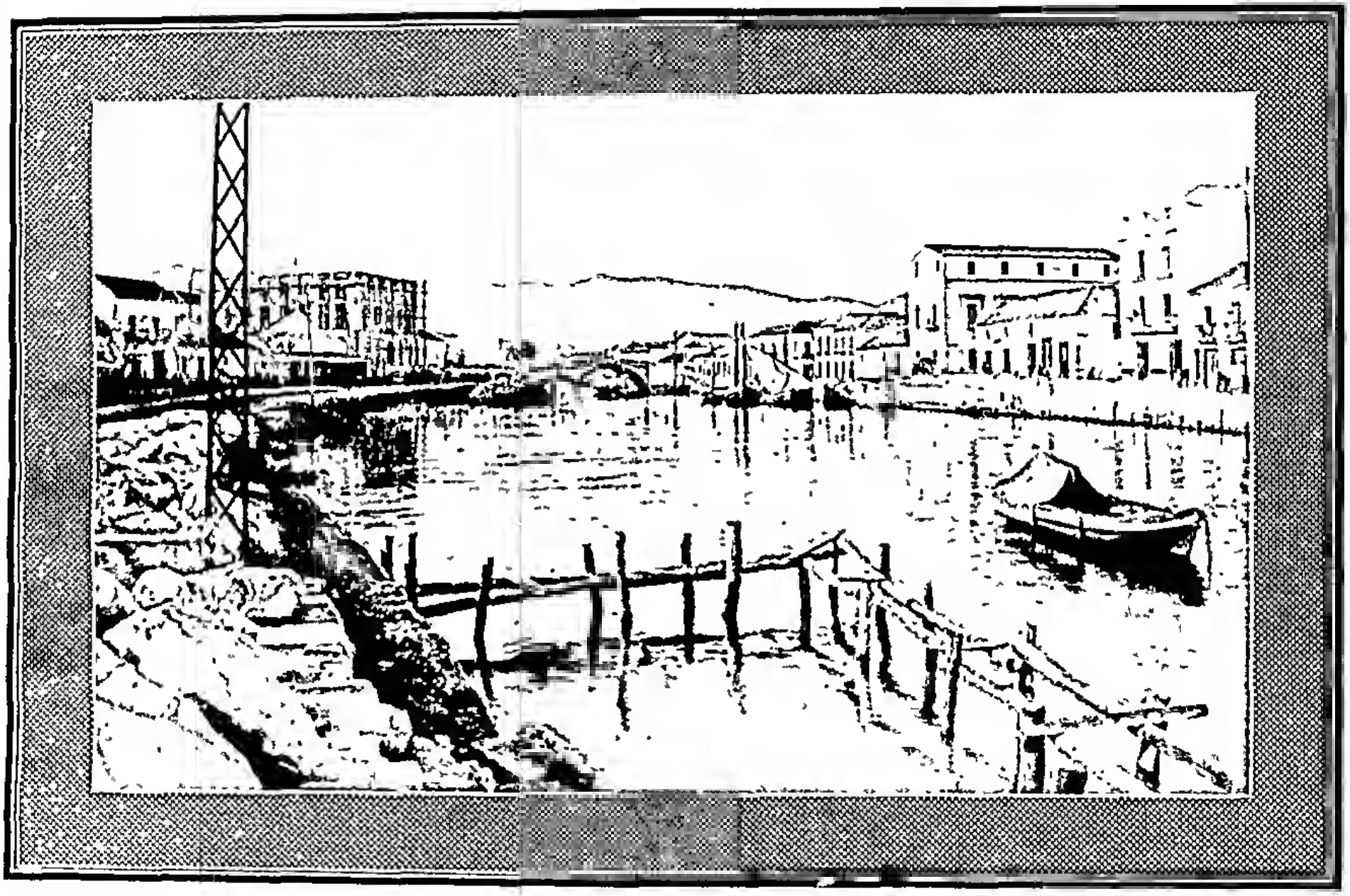
STITCH, STITCH, STITCHING AWAY.

Wallage & Gilbett.

PHOTOGRAPH BY W. J. PAPPS

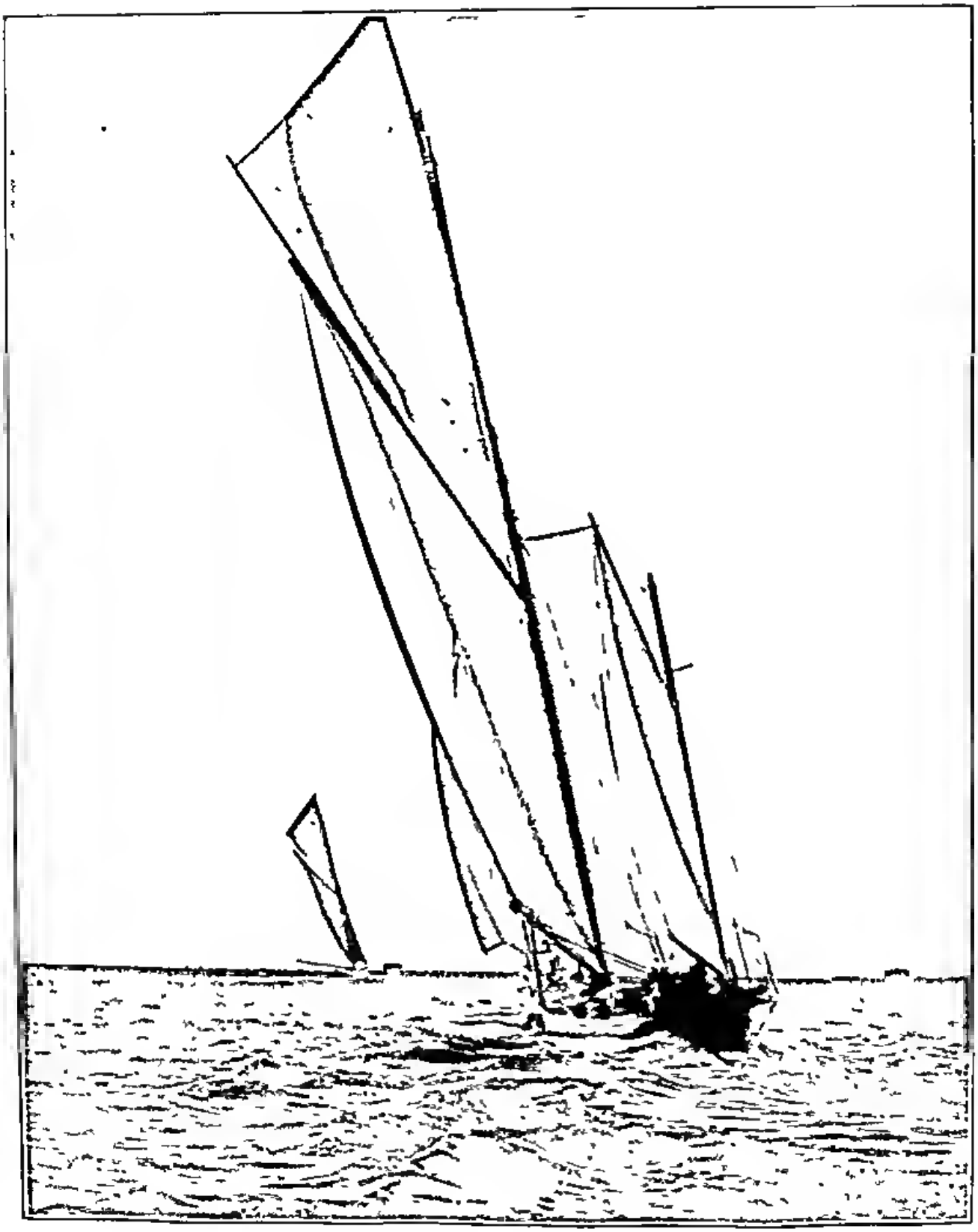
BY BUSH AND STREAM.
Near Maritzburg

P. Davis & Sons.



ALGECIRAS, SPAIN.

Isidro Cámara, "Nuevo Mundo."



PHOTOGRAPH BY WEST & SONS

KARIAD AND WHITE HEATHER.

Hamel & Co.

OIL PRINTING.

By JOHN P. GLOVER.

A GLIMPSE BEYOND.

Designed and Photographed by JOHN P GLOVER

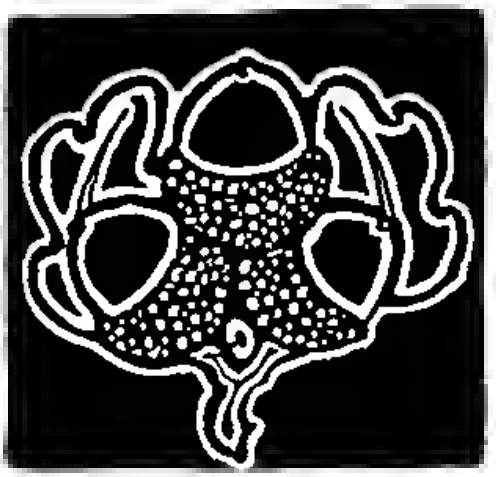
OIL-PRINTING, the new photographic cousin of the Collotype Process, has its rightful place in this issue of the PROCESS ANNUAL by virtue of its close relationship to the well-known colloid processes, which provide so large a part of the work of the process worker. This process is based on the property of the moist chromated gelatine film, which, when exposed behind a negative, takes oily ink only on those portions of the image which have been affected by the action of light.

The process gives results, in the hands of the careful worker, which perhaps I can best indicate by referring my reader to the examples in the last issue of this Annual, after page 136 ("A Bounteous Yield") and after page 52 ("Ice Yacht sailing at Stockholm.") For precise examples of the process, one should seek out the famous oil-prints of the present master of the process, M. Robert Demachy, of Paris. The chief feature is the very considerable "control" in the hands of the worker, a control permitting of the entire suppression of masses or details inimical to pictorial effect.

If a sheet of paper be coated with gelatine, and treated with bichromate, it becomes sensitive to light, and if after printing behind a photographic negative, the bichromate salt be washed away, the moist print will be found to have acquired curious if well-known properties. If a roller charged with greasy ink, be passed over it, or if a brush so charged be dabbed on to it, we find that where light has acted, the ink will leave the roller or brush and adhere wholly or in part to the print, whilst where there has been no light action, the ink will be refused, and the print left white. In the same way as with Collotype (Sinop, for instance), rapid rolling, or light brush work, greatly increases the steepness of gradation in the picture, even to the strengthening or suppression of parts. Herein lies the unique control of the process.

Before giving the detail of the process, I must add a personal note on the theory of it. Pure photographic writers seem to be puzzled to understand why they are able to obtain satisfactory half-tones; yet the explanation is perfectly simple. The most satisfactory papers are found to be Carbon Final Transfer Papers, and it is well known that these are prepared with a distinctly granular

On the printing press, if the lino should "sag" or blister by becoming unfastened from the wood base, a few fine brads driven through it into the wood will hold it down, and will scarcely show if the job is worked thickly Fish-glue, chewed bread, "mediums" and other delicacies peculiar to the craft, can make good any small accidental holes. Small designs, panels of decorative figures, etc., can be cut on an ordinary cheap knife-board, which can be bought for about sixpence, and is, of course, ready mounted and can be cut without any preparation.



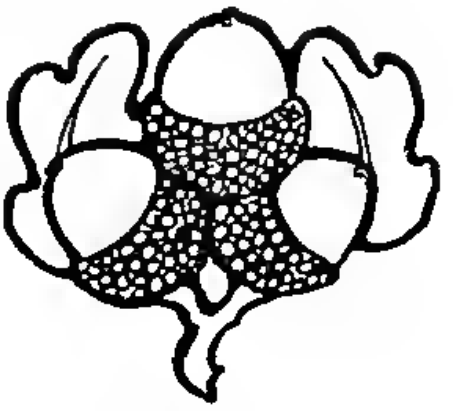
Heavy old-style type, mostly lower case, is the best to use around a lino-cut drawing, or the lettering may be cut as well as the pictures. Plenty of heavy rules also help to preserve the character of the work Almost any old thing, from a cider press to a mangle, will serve to print a lino-cut

It is true that lino-cutting is much easier than wood, but success with lino will be hastened rather than delayed by beginning with the more refractory material.

Designs for old-style wood-cuts consist of masses of solid black and shadow, no line being thinner than $\frac{1}{20}$th of an inch. Their broad effect is their most conspicuous characteristic. For showy commercial work, where two printings are used, one ink should be dark and the other light and bright. For the dark inks (which are printed from the key block) I have found black, green, violet and brown effective on various occasions; the lighter inks I have found most successful are vermilion, orange or emerald.

Very few readers of the PROCESS YEAR BOOK will need to be reminded that designs have to be reversed on the blocks before printing. When the drawing is finished, it should be painted with waterproof black ink on thin bank post or tracing paper, which, when dry, should be *firmly pasted down on the flat surface* of white pear, rock maple, apple, plane or beechwood. If the run is likely to be a long one, and the design of permanent value, the back of the board should be dovetailed with harder wood to prevent warping.

The novice can tell exactly how the drawing should be placed on his block by looking at the design reversed, by placing it at an obtuse angle to a looking-glass Blocks larger than about thirty-five square inches are cut on the plank. After some little practice the design can be drawn direct on the wood, Wolff's thick "J" soft lead pencils are the best for sketching bold designs on wood The dark masses in the designs and their relative position to each other, constitute at the same time the success and *composition of the work* A sharp pointed stick of type-writer's ink eraser will be useful for picking out light parts of the designs



The artistic feature and essential quality of a wood-cut, as distinct from any other kind of black-and-white drawing, is that drawing is possible both sides *of a line.*

With brush or penwork, the two sides or edges of a line are drawn

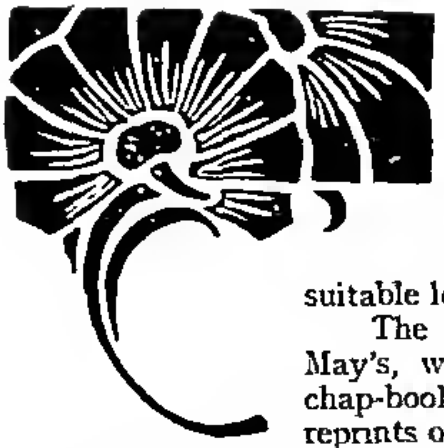
AN ORIENTAL BOOK LOVER.

A Cover Design for a booklet for Wald. Zachrisson's Printing Establishment ("Wezäta") by the Swedish artist Olle Hjortzberg.

Wald. Zachrisson.

When the tracing is done on the wood, or the tracing paper bearing the design face downwards on the surface of the wood is dry, cut around the outline where the black edge meets the white with a sharp pocket knife, or better still, a cobbler's knife. Then with a sharp "V" tool, clear away the wood on the outside of the outline, leaving the black part of the design supported by a good bevel approximating to the shoulder on a line block. Next cut away with a gouge to the depth of about half an inch all the unwanted wood which has not been covered by the ink of the design. As in wood-carving, the tool is pressed outward, and it must not be thumped or jerked. If it is sharpened every few cuts, it can be easily and steadily pressed forward all the time. The larger the white space of the design, the more deeply the wood should be cut from the top surface. When wood-cutting for two-colour designs, taking the first block as the key block, it is a simple matter to pull a proof from it in any pale tinted ink, and to paint on this proof in black waterproof ink where the second colour is required. In some parts of the design which need to be specially dark, it may be advisable to let the ink superimpose, *i.e.*, to print the second impression on top of the first. The method of cutting the second block is practically the same as the first, though the drawing will, of course, differ. Damp the surface of the block with a small wad of leather stuffed with wool, inking it with a little printers' ink; or, better still, ink it with a small ink-roller, lay a piece of tough thin paper on the inked surface of the block, burnish the back of the paper with a ruler, then peel off the paper and the impression will show your progress. When making the designs, especially if working on paper that is greasy by having been partially printed on, making offsets, etc., a drop of ox-gall in the water-colour ink will make it flow and cover easily. Small work, any size up to about thirty-five square inches, is best done on box-wood. Disused wood blocks which have been resurfaced can often be bought from old-fashioned dealers for a few pence each. They are, of course, not quite type-high, but a little card glued to the backs of the blocks will usually make them level.

Those who are fortunate enough to possess a copy of the PROCESS YEAR BOOK for 1904-5 can find facing p. 128 an excellent design by Edward J. Burrow



illustrating the bold style of colour work for which lino-cutting is peculiarly adapted.

Any reader who is lucky enough to happen on copies of the old English ballads and broadsheets, which were illustrated with quaint, simple woodcuts of the kind described at the beginning of the article, will have a splendid example of the style to follow, and the most suitable lettering to adopt.

The late Mr. Andrew Tuer, an intimate friend of Phil May's, was an enthusiastic collector and republisher of old chap-books. Field and Tuer, and Simpkin Marshall, issued reprints of *Olde ffriendes wyth newe Faces* (adorned with suitable sculptures) in one thick quarto vol., 25s. Also, *Crawhall's Chapbook Chaplets*, uniform in price and size with the above. Both were "Emprynted at ye Leadenhall Presse"; both are typographical landmarks of one of the most fascinating periods in the history of the Art Preservative, and most are most usefully suggestive to the lino-cutter.

CUPID AT THE WELL.

CINERARIA.

Reproduced exact from the living plant

H. Kollien & Son.

COLOURED LIGHTS FOR COLOUR WORK.

By E. J. WALL, F.R.P.S.

A Halt by the Wayside

Engraved by London Etching Co. Photograph and Design by Ernest W. Jackson.

THE ideal method of working the three-colour process would be, I think, to use three plates, each sensitive to the required spectral region, and to illuminate the copy in each case with a light which should only suit the required spectral rays. This would considerably facilitate the preparation of filters and inevitably shorten the exposures.

Quite recently it has been announced in the German journals that Dr. Albert, of Munich, has placed on the market three collodion emulsions, sensitized respectively for red, green and blue-violet, which require no filters. Whether these are going to prove satisfactory in practice remains to be seen.

For process establishments the use of arc lights considerably facilitates matters, for there is no difficulty in obtaining impregnated or flame carbons, which will give distinct yellow and orange-red lights. As the use of different carbons for each exposure would necessitate a loss of time in changing the same, this might be brought forward as an argument against their use by the process worker, to whom time is a serious consideration. This little trouble has been entirely overcome, however, by the introduction of the "Tri-Ultra" lamp, figured on page 50 of the advertisements of last year's ANNUAL.

By the courtesy of the editor, I have had an opportunity of examining these effect carbons spectroscopically, and a few of my tests are shown herewith. It is obvious that taking an extremely pure carbon, and this term can only be used in a relative sense, for it is impossible to make absolutely pure carbons, the light is very rich in blue and violet rays and it will be almost an ideal light for use with the blue-violet filter. The richer this light is in green, orange and red rays, the darker must be the filter, or probably, to put it more correctly, the poorer it is in the less refrangible rays, the weaker in colour we may make our filter, with a suitable plate and thus shorten the exposure.

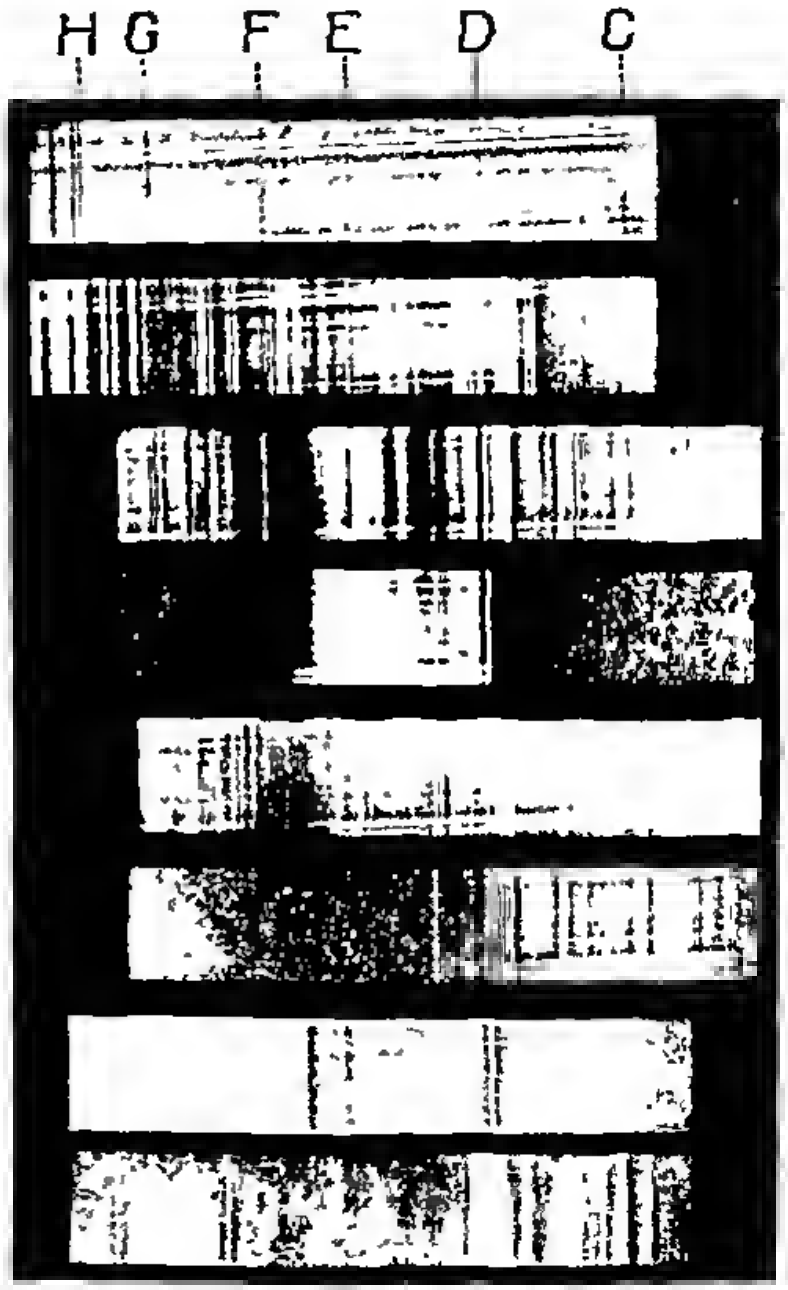
The spectrum of such a carbon is shown in No. 2.

Dealing next with the light for the green filter exposure, there is not, as stated by the editor of this annual in last year's issue of Eder's "Jahrbuch," any green carbon commercially obtainable, but there should not be, as he says, any difficulty in making the same.

One of the most brilliant green lights is given in the arc by silver. It is practically a pure green light visually; examined spectroscopically, one at once sees that it is also rich in blue and violet.

Why, then, should we *not* use carbons with a silver wire core?

It may be contended that the expense would be heavy; but with metallic silver costing about half-a-crown an ounce, this need hardly be considered. Besides that, we need not use pure silver, for an alloy of silver and copper would give a greater intensity of green rays. The advantage of this alloy would be that it would give no rays towards the less refrangible end beyond λ 5782. If the cost were a consideration we might use an alloy of silver, copper, nickel and cobalt, with which we could practically fill up the whole of the green region transmitted by the green filter. Unfortunately, however, the introduction of nickel and cobalt means increase in the blue and violet rays, not, however, an increase at the other end save for one nickel line at λ 6176 and the familiar Ni line between the two *D*'s.



I have been endeavouring to get alloys made on the above lines, but some commercial wheels move very slowly. Whether it is possible to impregnate soft-cored carbons with aqueous solutions of salts of the above metals in sufficient quantity to be of any practical value, I am at present unable to state, as my experiments are not complete.

Failing a green carbon, the next best are the yellow flame ones, for these owe their colour to salts of calcium, which give us broad bands in the orange-red and the green, which, combined, give yellow. The wider we can make our bands, or the stronger the lines in the green the better

The spectrum of one of these yellow flame carbons is shown in No. 3. No 4 shows the same taken through a green filter. The exact absorption of this filter must not, of course, be estimated from this, because photographing the arc

direct excessively strong lines in the region of what by reflected light would be complete absorption, naturally show themselves.

Coming now to the red filter record, we have the orange-red flame carbons shown in No. 5, and through the red filter in No. 6. These are very satisfactory and the light is distinctly crimson, this particular hue being due to the admixture of the violet rays with the red. It would be possible, of course, by the use of other salts than those used, to make the light still richer in red rays, but it must not be forgotten that the more salts introduced into the arc, the greater the trouble from spluttering and wandering of the arc itself. It is even possible by using certain salts to have an arc which practically travels round and round the hard carbon leaving the soft impregnated core as a molten bead in the middle. The light from such an arc varies enormously.

In taking the accompanying spectra, the positive crater was cut out of the field of view as far as possible, by making the lower carbon the positive and focussing the arc itself on the spectroscope slit by means of a condenser.

To amateur workers, who may not have access to arc lamps, the above notes may not be of much interest, there is no reason, however, why they should be debarred from using coloured illumination for still-life subjects, as I think will be well seen from Nos. 7 and 8. The former is the spectrum of a panchromatic magnesium flashlight, whilst No. 8 is that of burning magnesium ribbon. No. 7 distinctly shows how much richer in orange and red the panchromatic mixture is and the few trials I have made, distinctly prove that in practice the colour rendering is far more satisfactory with these than ordinary magnesium The time of exposure is so much shortened, too, that it is an easy matter to amuse oneself, on a winter evening with making three-colour negatives.

No. 1 is merely a daylight spectrum for comparison All the above were taken under, as far as possible, similar conditions, with a metallic grating spectroscope. It would have been possible to have recorded more in the red or more in the ultra-violet; but in the former case we have reached the practical limit of red sensitiveness of the plates used, and in the latter the absorption by the glass of the filters and the lenses soon comes into play.

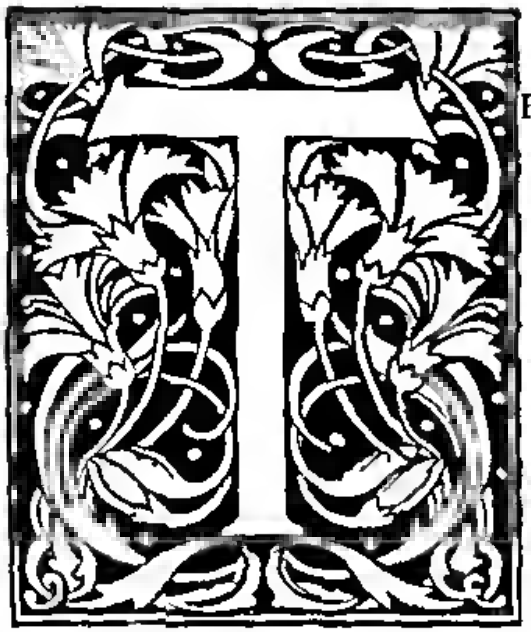
LLANBERIS, NORTH WALES

Engraved by
LONDON ETCHING CO

Photograph and Design by
ERNEST W JACKSON

AN ARTIST'S DIGRESSION.

By A. MURRAY.



Design and Block by
Archibald & Fowler.

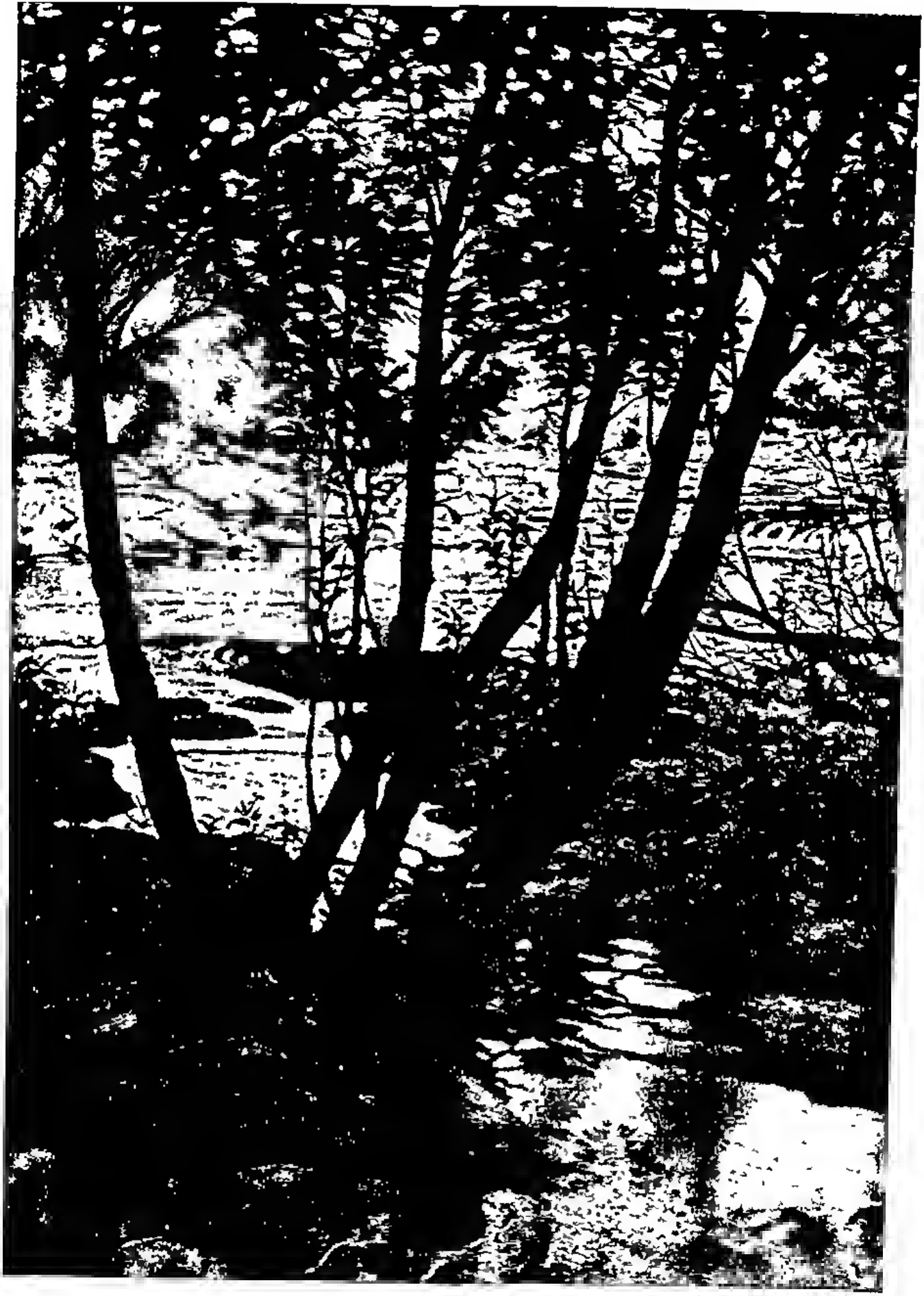
THAT one may shift his sphere of operations without being subject to adverse comment might be taken for granted in the professional life of to-day, with its spirit of adaptability to new conditions and changing environments so ever alert. Yet I am criticised for laying aside the brush and taking up the camera as a medium of expression in art.

My orthodox brother artist will have it that I am under a heterodoxical delusion if it is imagined that I can produce by operative means what the cunning of the hand alone is fitted to accomplish. He accuses me of avoiding the painstaking persevering work which reveals the soul of art sentiment within, and urges that no further serious art production need be expected from me since my medium of expression is limited to that which an optical lens can transmit.

The art critic, again, pronounces this step as a digression due to sheer inability to express myself with the painter's utensils and that I seek success by a method which will come more readily to my hands. There is perhaps more questionable reflection cast upon my powers in this latter comment, and yet there is but small comfort in turning towards some of my photographic friends, who, though willing to welcome any artistic ability that might be brought within their sphere of labour, yet are ready enough to question my unconventional methods of work.

That a novice in any sphere, who has a spark of originality in him at all, will be unconventional, might also be taken for granted without having it put down as unlicensed meddling with the fundamental principles of the art. Yet, I am barely within the field when my mode of procedure is questioned, and they begin to build walls of manipulative technicalities to keep one in the authorised ruts. I am asked to discard my brush, except for mounting purposes, and to be conscientious in the use of my pencil, if I venture to use it at all; in short to have a regard for truth as stated by the optical lens, and not to thrust in my own version of what it should be. Such doctrine might so influence some as to cause them to retrace their steps; however, I have more grit about me than to allow these conventional purists to have all the say in the matter.

Were I devoid of an ideal and without a message to convey through my art, or saw no means of adapting any photographic process to my purpose, I would not pursue this course, but since the medium is extending its facilities for artistic treatment and giving greater freedom for manipulating its operations according to the will and taste of the artist, I feel sure that I am but one of many who are



A SHADY SPOT.

COLOUR PHOTOGRAPHY. THEORIES OF VISION.

By CHAS. GRAVIER,

Editor of "Le Moniteur de la Photographie" *(Translated by E. Mels.)*

"TEA-TIME"—A USEFUL MAN

Photograph and Block by W. C. KEENE.

WE think that we ought to mention the principal theories which have been proposed for explaining the "visibility" of the colouration of bodies. To begin with, we are a little sceptical about the utility of these theories We certify, however, that—the moral sentiments of the honest man excepted—we are ready to abandon the opinions which we may have, when it is demonstrated by experience that they are wrong. This was a maxim of Chevreul's.

The colour of bodies is the result of a particular sensation; it is of a psycho-physiological order, and through this fact it can only be presented under the form of a hypothesis, and as a consequence is contestable. The principal theories, not going farther back than the last century, are those of *Young, Helmholtz, Maxwell* and *Héring.*

That of Young adopted by Helmholtz, and afterwards by Maxwell, admits that there exist in the retina three kinds of different nervous fibrils, of which each is capable of feeling only one of the three elementary fundamental colours, as they are called.

Thus, one of these fibres is only sensible to red; the other to green and the third only to violet or blue. Each of those fibres possesses accordingly a specific energy.

It is from these three fundamental sensations of red, green and violet that all our chromatic sensations result. The excitations of these hypothetical fibres are provoked by the more or less energetic undulations of the ether, an imponderable fluid transmitting simply the vibratary energy of the residue of the light not absorbed by the bodies.

The three kinds of fibres have not so far been perceptible. Young and his followers admit that, according to the vibratory speed of the different waves, corresponding to the transmitted colourations, these fibres are at the same time individually and simultaneously more or less excited, and it is that which causes the different shades to be perceived.

To provide his theory with a basis Young produced a graphic table constituted of three curves overlapping each other more or less according to the shade or the pure defined colour.

These curves have been modified by the different physicists or physiologists (Helmholtz, Maxwell, etc.), who have admitted the theory of Young, which proves that the sensations of the colours are different according to individual examination, and it is this we beg our readers to note.

The undulatory theory of Fresnel has been discussed for about ten years. "Fresnel thinks the vibration is perpendicular to the plane of polarization. Norman regards it as parallel to this plane. We have sought for a long time for an *experimentum crucis* which would enable us to decide between the two theories, and it has not been found." (H. Poincaré).

"The formula will retain its practical value. Only instead of corresponding to the vibratory state of an imponderable elastic medium should the period perhaps be attributed to the helicoidal movement of a corpuscle . . . unless one resigns oneself to not giving any explanation, and being content to use an instrument of which one does not know the mechanism." (O. de Lapparent).

These are two members of the Institute, who speak thus of this theory, which one desires photographers should become impressed with so as to arrive at photography in colours. We, however, do not insist upon it.

The theory of Héring is of lumino-physiological order. There exist six simple sensations of vision; all the sensations resulting from their various combinations. These fundamental, elementary sensations which are disposed in antagonistic pairs or couples are—black and white, green and red, blue and yellow. The four last are the four simple colours. These six fundamental sensations exist always at the same time, but some between them are, one may say, an act, whilst the others are too weakly excited to surpass what the psychologists call the sill of the conscience; they remain below, but they exist nevertheless.

What is the organic substratum of these six elementary sensations? They are not here nervous fibres, as in the theory of Young-Helmholtz, but equally hypothetic substances called by Héring psycho-physical substances or visual substances, and it is from the chemical changes which these substances undergo when the organ is working that we should be able to deduce their physical cause—the elementary functions we speak of. By supposition, a photo-chemical phenomenon takes place here, which recalls just what one knows about the destruction and regeneration of the purple of the retina, as described by Boll and Kühne, which will help in understanding the theory of Héring.

If the sensation is due to the disassimilation of the visual hypothetical substance, that of the black, which takes place without direct excitation of the light, results on the contrary from a state of an organic reparation or assimilation. When the assimilation and the disassimilation balance each other, we have grey.

The disassimilating colours are white, red and yellow, the assimilating colours black, green and blue.

In the two preceding theories, which we have only touched upon superficially, because the examples would lead too far, the things take the same course and each of them has its defenders. When the fatigue for one of these colours makes the sensation disappear or diminish, the other colours can be perceived, but the complementary colour is the dominating one. Charpentier distinguishes the absolute sensation, as luminous sensation and chromatic sensation, the first one being seen at first and serving as excitation to make the second one apparent. He is not of the opinion that the explanation has to be sought in the layers of the retina.

Chevreul was not a supporter of the hypothetical doctrines, he established the phenomena of chromatic contrasts without explaining them, as he did not want to discuss a phenomenon without experimental evidence. We believe

PORTRAIT STUDY.

Negati.e b H Valter Barnett o. a W gton Speedy Plate
Half-To . leraltue on a gton C ho Process Plate)

Meisenb . W. .rks.

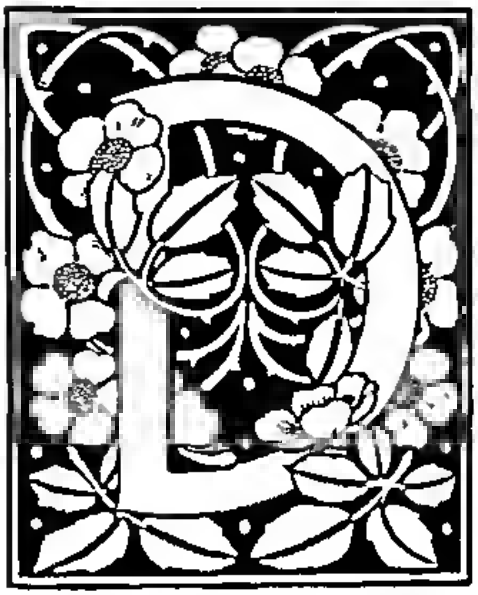
PAINTING BY

DUTCH FISH MARKET.

agerer & Co.schl.

RECENT ADVANCES IN COLOUR PHOTOGRAPHY.

By Dr. HENRY E. KOCK (Cincinnati, O).



Design and Block by
ARCHIBALD & FOWLER

DURING the past year three new processes in colour photography have been brought forth that mark a distinct advance on all previous efforts. They all are along lines of advancement indicated in this YEAR BOOK some three years ago, the most prominent tendency being toward the one-plate exposure.

The first process to be discussed is the one from which the author promised great results if successful, the one by Lumière Bros., of taking granules and dyeing them with the three primary colours. The experimental success and the manufacture on a large scale are two entirely different problems, and from last reports I have it that the Lumière Company hopes to bring the plates on the market in the near future. They have decided to use granules of potato starch for the basis as colour bearers, but the details of procedure have still to be made public. Whether the resulting pictures are to be unicate or not is still to be answered, as this depends entirely on the colours used in dyeing, the method of development, and whether it becomes necessary to invert the silver image or not. Of all the methods this one appears on its face to be the simplest. That it is not as simple as first sight and thought suggest is evidenced by the fact that the Lumière Bros. have been working along these lines for at least two years. From their previous successes it is doubtless that their untiring effort will at last prove successful.

Another process that bids fair to be more or less successful is one brought out by the manufacturers of Uto paper, Dr. Smith & Co., of Zurich, Switzerland, under the name of Hexagonal Plates. These differ from the irregular granule plates of Lumière, in having a regular pattern, hexagonal in form, made by the interseetion of lines of the primary colours.

The greatest difficulty of success lay in the faet that an emulsion could not be made that was equally sensitive with regard to rapidity to all three colours. The details of procedure are more or less the same as in the next process to be described, and will be taken up in detail there.

The last and at present the most important new process of colour photography is based on the principle of Professor Joly, of Dublin, and was worked out by Louis Dueos du Hauron with the assistance of Monsr. Berçegol. Any sized plate can be made, time of exposure is short, the manner of manipulation is simple, the

colours true to nature, but the results are always unicate, *i e.*, as many pictures as original exposures, and no more The plates, called Omnicolour, are prepared as follows·—First, covered with a substratum of gelatine. Upon this lines are printed at three angles, the first colour with grease ink, the second colour with grease ink showing an antipathy for the first ink, in this manner preventing the overlapping of the two colours; the third colour is laid on by immersing the plate in an aqueous dye. This stains only the gelatine not covered by the first two grease inks, as these repel the aqueous dye. Of course, the width of lines is gauged so as to have an equality of all colours To correct the difference in intensity of colours, and prevent over-exposure of one colour, an emulsion is prepared for two colours and a compensatory filter equalizes the time of exposure, which is for full lens opening $\frac{1}{5}$th of a second Upon this filter surface the regular emulsion is spread and allowed to set The plates are placed behind the compensatory filters, with the glass side toward the lens, so that the light passes first through the glass, then the line filter and then strikes the emulsion. After the exposure, the plates are developed like an ordinary dry plate After development, the negative image is destroyed by means of potassium bichromate solution, to which some strong mineral acid has been added. After two minutes the negative picture has disappeared, and the silver emulsion shows up the picture as a positive by transmitted light. This is reduced, after washing in sodium sulphite 1 5 and then in water, by placing the plate face down in the developer and allowing white light to fall upon the back of the plate In this manner the negative is inverted to a positive, which shows up as a true reproduction in colours. After fixing and washing the plate is dried and mounted as a transparency. These transparencies are marred, of course, like a three-colour print by the cross-hatch, but thrown on the screen as a transparency this becomes indiscernable at three feet distance.

The Omnicolour plate does not permit snap-shot photographs, but neither does any other natural colour method, the register, however, is perfect, and there are no overlapping edges nor are there colour fringes to slowly moving objects, as waving trees, etc., that mar the separate three-colour print.

It may be suggested by some that there are several cameras attempting to obtain by means of mirrors or prisms three separate exposures at once, but of all these reported and claimed inventions the market still awaits the arrival of such a successful camera.

This process, then, is the most successful of all colour methods, whose advantages have been enumerated before, and all that remains necessary to make a perfect colour photography method is to be able to print multiple positives from one plate and these upon paper.

Perhaps the application of Dr. Smith's Uto paper, based on Neuhaus' and Worel's experiences, might be tried to obtain numerous prints from such a positive, but this would necessitate a stripping and turning of the film to ensure true right and left.

A WORD ABOUT COLOUR WORK.

By C. REAL.

"WE TWA HAE PADDL'D I' THE BURN"

Block by HARRAND & FULLER

Photograph by R. BRAID

THE progress of colour reproduction during the last few years has exceeded the expectations of those engaged in this class of work, and it must give them the greatest satisfaction to look back on the achievements of the past.

The voices of those who predicted a complete or partial failure have been effectually silenced, and those who looked upon this departure of process work with doubts in their minds have been compelled to alter their views and to modify their arguments; for since colour work is no longer in the experimental stages but has become a power in the process world, its success and possibilities are no longer debatable points.

A process that is capable of facsimile reproduction, both in texture and colour, was bound to leap into prominence, and could not fail to attract favourable consideration. But he would be a bold man who would declare that perfection had been reached, for it is impossible to foresee the developments the next few years may bring, nor can the possibilities of such a process be estimated.

The growing interest that is taken promises a steady and perfecting improvement, and it is a notable fact that the most prominent firms (who, it may be said, are specialists in this branch of photo-engraving) are by no means satisfied, but are conducting persistent trials and experiments in new directions, and this augurs well for the future.

Mainly four points claim the attention of the investigators, and they are—firstly, to do away with the colour filters and bring the emulsions to such a state of perfection that it will be possible to get by emulsion only such a separation of colours as is now only obtainable by the conjunction of filters and emulsion. Then there is the question whether to use half-tone dots for all colours, or to have a combination of dot and line.

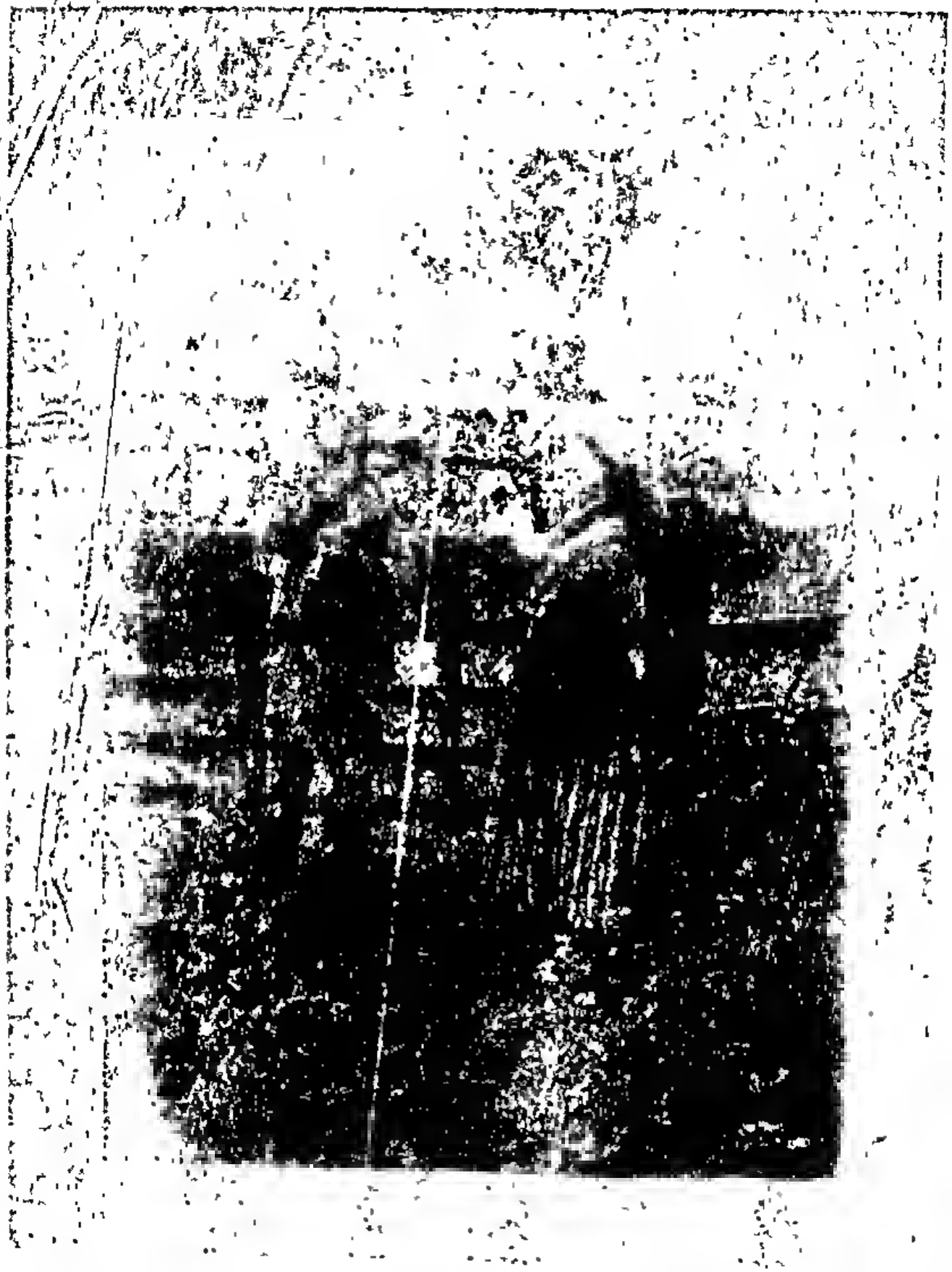
Several houses use line for their red and yellow, and dots for blue or key, but to reverse the way, as some are inclined to do, seems not advisable, for it must be borne in mind that by the use of a single line screen the details suffer, and to have a lack of detail in either key or blue (which latter in three-colour work is practically the key) is detrimental to a good reproduction.

The angles under which the respective screens ought to be ruled also come in for their share of attention, and in the production of a good colour print the

PHOTOGRAPH BY GRAYSTONE BIRD

OUR PRIDE AND JOY.

Arthur Cox Illustrating Co., Ltd.



OUR PRIZE AND ...

Arthur Cox Illustrating Co. Ltd.

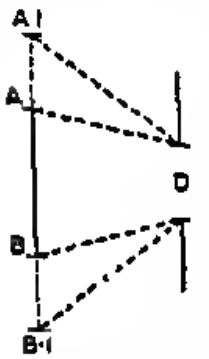
AN OLD SALT.

all lenses are the same speed. I wish to say, most emphatically, that it is possible to obtain equivalent negatives with different lenses with a difference of 300 per cent. in the exposure with the same equivalent aperture and on the same plate.

Take as an example an average landscape with near foreground as subject in best summer light with a plate of the special rapid type about Wynne 78. This, according to the Wynne meter, will require $\frac{3}{8}$ths of a second at //32, and with the ordinary rectilinear lens, whose full aperture is //8 this will probably be quite correct, but with a Goerz anastigmat, whose full aperture is //4·5 and also stopped down to //32, the same result can be obtained with an exposure of $\frac{1}{8}$th of a second or $\frac{1}{3}$rd of the other exposure

Now, how is this? I commenced by saying that I pinned my faith to an Actinometer, and so I do, but I do not follow the maker's figures when I am using rapid lenses.

The Hurter and Driffield Actinograph is the only instrument that I have seen that attempts to give any variation of exposure for different types of lenses, but their variation is not nearly sufficient and tends rather in the opposite direction when considering the modern anastigmats. I will indicate the reason for the difference in speed of lenses of various apertures by a very simple illustration.



Let A-B represent a lens whose diameter is $\frac{1}{8}$th its focal length, that is to say, a lens of 8 inches focus would be 1 inch diameter; let D represent a diaphragm whose diameter is $\frac{1}{16}$th the local length of the lens, that is //16; this diaphragm collects and passes rays of light from the whole surface of the lens, not only from a certain space in the centre.

Now let A1-B1 represent a lens whose diameter is $\frac{1}{4}$th its focal length, which in the case of a lens of 8 inches focus would measure 2 inches in diameter.

Does it not stand to reason that such a lens would transmit more light through the same size aperture in this case //16, which is just the same size at //16 in the //8 lens, but which collects its light from practically four times the area of illumination? How then can all lenses be the same speed at the same equivalent aperture?

Before proceeding, I would like to relate a little experience I had last summer on the North Wales coast. I was snap-shotting with an //6 lens on the shores of a beautiful bay and the light was at its very best, that is 1½ seconds test by the Wynne meter. The subject was a nice bit of rocky foreground in good light, the bay dotted here and there with boats and on the further side a couple of mountains. According to my usual method I found the exposure to be $\frac{1}{10}$th of a second at //22, using a rapid film While I was making my exposure, a gentleman arrived and erected a tripod with a ¼-plate Goerz-Anschutz camera attached, and after focussing made an exposure; then he turned to me and remarked on the beauty of the scene. Naturally the conversation turned to our apparatus and after telling me that he was using a 4·8 lens and the same films as myself, he remarked that he was giving $\frac{1}{10}$th of a second exposure at //16. Whereupon I remarked that he was giving at least double what he ought to give; he replied that he was using so-and-so's exposure tables and he doubted if I was correct. However, I persuaded him to make another exposure giving just half of the previous one, and judging from what I obtained from my exposure, I have no doubt as to which was the better negative.

Since then I have had some experience with a similar lens, and I find that it is much faster than my //6 at the same working apertures.

Since this experience, I have spent a few days on tramp with a photographer whose business it is to make negatives for post-cards for one of the publishing houses, and on comparing his exposures with those indicated by three different exposure meters and tables, I found that he was giving just half. He was working with an *f*/6·5 lens and had found his exposures by experience.

Well! "so far so good." The next question the photographer will ask us: "What is the good of exposure meters if they are incorrect?" The answer is that each worker must decide for himself what the normal speed of his lens is to a certain speed of plate (and I think that every one will agree that it is better to find a plate that suits one and stick to it).

I will now endeavour to indicate the way to use an exposure meter successfully for all classes of subject, without calculation of any kind, providing it is within the scope of the meter, and I must say that up to the present there is no meter on the market which covers all the ground, but as I have had the most experience with the Wynne meter, I will describe my method of using it. I first decide for myself what exposure gives me the best results under any fixed conditions of light and subject, say a landscape with near foreground slightly in shade, which we will call our normal.

Suppose the actinometer test is two seconds, and I find that one second exposure at *f*/45 will give me just the quality of negative I am seeking, then if I set *f*/45 opposite one second on the Wynne meter, opposite two seconds will be found *f*/64, and that is the normal speed of that plate to the lens in use.

Now if instead of calling *f*/64 the speed number, we call it the normal subject number and then calculate a table from this which will give us a different number for each class of subject, we shall arrive at a workable and easy method of deciding the exact exposure necessary for any and every subject.

On the back of the Wynne meter is engraved a table which tells us how much to divide or multiply the normal exposure for exceptional subjects, but as this entails calculation every time, it is better to do this once and for all and make a table as follows: Open landscape without near foreground, open lake, river and beach scenes. Here the table says, divide by $\frac{1}{2}$, then set *f*/45, our exposure diaphragm for the normal subject which required one second exposure, opposite to $\frac{1}{2}$ on the exposure scale, then opposite to the actinometer time, two seconds, we find *f*/90, this will be our subject number always for these subjects.

Next we get sea with ships, snow scenes, white statuary, open panoramas, divide by $\frac{1}{4}$. Set *f*/45 opposite $\frac{1}{4}$ and opposite 2 seconds we find *f*/128; this will be our subject number for any of these.

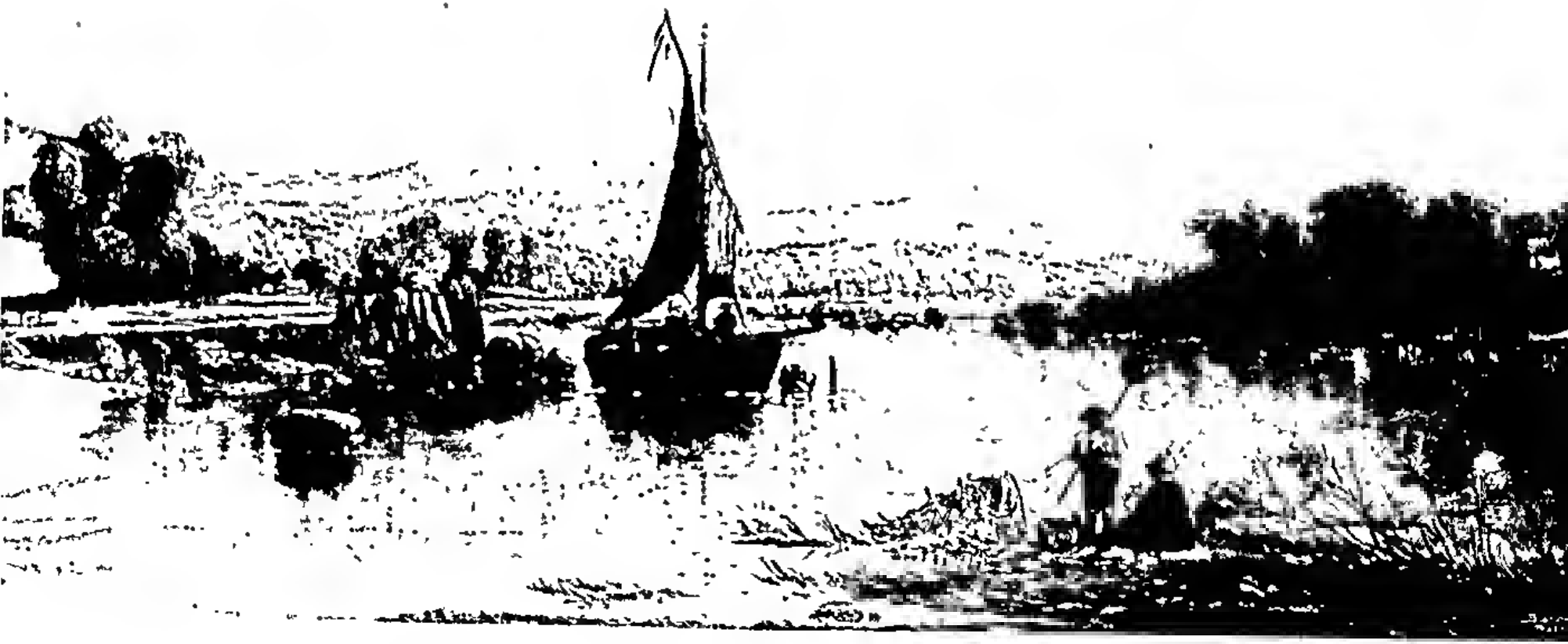
Sea and sky $\frac{1}{10}$. Set *f*/45 opposite the nearest to $\frac{1}{10}$, that is $\frac{1}{11}$, and opposite 2 seconds we find *f*/222, which is our subject number for sea and sky.

At the other end of the scale we get the subjects that require more than the normal exposure, such as portraits or objects near the camera; the table says 1½ times normal. Set *f*/45 opposite 1½ and we find *f*/56 to be our subject number. And for extra dark objects near the camera, twice the normal, which will give us *f*/45 as subject number.

We now have a table which reads as follows:—

Sea and sky	*f*/222
Open panoramas, etc.	*f*/128
Open landscapes, etc.	*f*/90
Normal	*f*/64
Portraits or near objects	*f*/56
Dark near objects	*f*/45

This table, when the figures are accurately adjusted to the plate and lens in



ON THE DART.

(From an Old Painting by A. H. Vears.)

The second point which will probably produce trouble is the variation in the development factor of the plate. Different batches of the same plate require different times of development. Thus for instance, taking three successive batches of a bathed plate, all bathed and dried within a fortnight, the first batch required for the development of a landscape

	at 65 deg. Fahrenheit	.....	$7\frac{3}{4}$ mins.
the second	„ „	.....	$6\frac{1}{4}$ mins.
the third	„ „	.....	$8\frac{1}{2}$ mins.

And these variations are by no means extreme, but simply selected at random If our three plates require different times of development to obtain the same gradation we shall, if we develop them for the same time, get three different gradations resulting, and if we photograph a scale of greys we get different tints at different ends of the scale, so that the high-lights may be bluish, the deep shadows rusty

If, on the other hand, we attempt to develop our plates for a time to get even gradations, we have before us a task from which the most skilful might shrink; and it is extremely improbable that we shall have any plates left by the time we have settled on the ratio and the time of development, if we started with a dozen of each kind

So that from both these points of view great advantage is attached to the use of one plate. The time of development for all three negatives must be the same, and the differences of gradation will only be the slight ones inherent in the plate, and due to the fact that to some extent the gradation of a plate varies with the colour of the light to which it is exposed. Moreover, such variations as may occur in the colour sensitizing will be slight, and can easily be indicated by the plate maker, while variations in the intrinsic speed of the emulsion will merely affect the duration of the exposure, and not at all the ratio of the exposure.

When dealing with half-tone negatives taken direct through the half-tone screen, these considerations scarcely apply. The gradation is then fixed by the screen, and variations in the ratio are of small importance in a process studio, where a negative can always be repeated at once, and a large number of plates of the same batch will be ordered at the same time, the operator becoming rapidly used to that batch

All these considerations apply to commercially-bathed plates, which can be relied upon to present regularity and homogeneity throughout a batch. An important consideration as to the relative cost of using commercially or home-bathed plates is that the latter vary greatly in speed even when made at the same time, so that an operator cannot find the ratio for a set of large negatives by trials with small plates. Another disadvantage of home-bathed plates is that such things as ratio and speed tests, which are found definitely for the whole batch by the plate maker, are by no means convenient measurements to make personally on a small scale.

THE LATTICE WINDOW

Block by HALF TONE ENGRAVING CO

Photograph by W GILL

FROM A PAINTING BY TITO CONTI

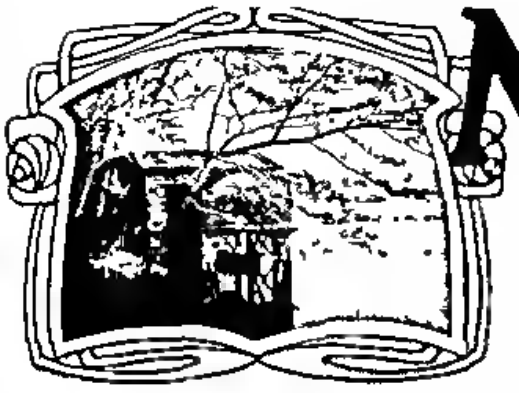
"PAYING HER RESPECTS TO HIS HIGH MIGHTINESS."

(By permission of Governors of Royal Holloway College, Egham)

Geo. Newnes, Ltd.

A COLOUR-SENSITIVE COLLODION PROCESS.

By ARTHUR PAYNE.



THE OLD BOATHOUSE

Block by MARSHALL ENGRAVING CO Photograph by F N TIPTON

MANY years ago, to be exact, in 1873, Messrs. Henry Greenwood & Co., of London, published a pamphlet entitled "A new wet collodion process," written by Thos. Sutton In brief, Sutton's process required the use of a bromized collodion that was sensitized in a strong silver bath, the free silver nitrate was then washed out of the film and a gelatine organifier applied, after which the plate was exposed, washed, and developed with an alkaline developer In the preface to this pamphlet the author says that his method is based upon a dry method published some years ago by Major Russell

A perusal of the pamphlet shows that the author failed to comprehend the difference between the chemical and physical development of a collodion negative, for he repeatedly comments upon the many advantages possessed by his method over the old wet-plate process, in which the silver is deposited by means of an acid developer upon the surface of the film, whilst in Sutton's process the image is embodied within the film itself, and is formed by the use of an alkaline developer. As a matter of fact, the bromized collodion plate, when sensitized and washed, is analogous to a collodio-bromide emulsion, and possesses all its characteristics; therefore Sutton used a misleading title when he referred to it as "A new wet collodion process," for his only justification was the fact that the plate was exposed in a moist condition.

In PENROSE'S PICTORIAL ANNUAL for 1903-4 Mr. W. T. Wilkinson published an article, on page 84, entitled "A new wet collodion process," in which he showed the possibility of using this process to obtain a colour-sensitive collodion film.

The purport of this article is to describe an adaptation of these processes by means of which a colour-sensitive collodion film may be prepared that possesses all the properties of a collodio-bromide emulsion, and, moreover, produces a film with a remarkably fine grain. Furthermore, it is a process that may easily be carried out by anyone acquainted with the procedure of wet-plate photography.

The plates are prepared by coating well-cleaned and substratumed glass with a collodion containing about 12 grains of a bromide salt to the ounce, or Mawson's bromized collodion (which is sold ready for use) may be used This collodion film is sensitized in a strong silver bath, which should be kept up to a strength of about 70 grains of silver nitrate per ounce of solution.

Silver Bath for Bromized Collodion.

Silver nitrate	2 ounces avoir.
Distilled water	12 „ fluid.

This bath is used in a neutral condition to obtain the highest possible sensitiveness, and in this state it generally gives a clear plate. The plate must be allowed to

remain in the bath until a rich creamy film is produced; this usually requires an immersion of from five to ten minutes, the exact time depending upon the temperature of the bath. As the plates are removed from the bath and drained, they are immersed in distilled water contained within a grooved porcelain tank, or other utensil. When sufficient plates for the work in hand have been prepared, or the tank is filled, the plates are allowed to soak in the distilled water for at least five minutes, this water is then poured out into the residue cask and the tank again filled with distilled water, and the plates allowed to soak for another five minutes; this operation is repeated four times, until the plates have been soaked in six changes of water. They are then allowed to remain within the tank, covered with water, until they are required for use. It is probably hardly necessary to mention that none but the first wash water is worth saving among the residues.

These collodion plates are now in a suitable condition to be colour-sensitized by means of most of the dyes that are used with collodio-bromide emulsion, so that it is possible to substitute these collodion plates for the plain emulsion whilst still continuing to use those colour-sensitizers and light filters to which the operator is accustomed. The dyes are applied by flowing over the plate a very weak solution of the dye in alcohol, of a strength of about 1 in 50,000.

The plate may be sensitized for the yellow printer in three-colour work by flowing over the surface a weak (about ½ per cent.) solution of silver nitrate. Or the plate may be sensitized in a similar manner with the following solution of silver eoside, in which case it will be necessary to cut out the yellow and green rays of light by means of a light filter, as the plate so prepared is sensitive to these colours:—

Silver Eoside Solution.

Eosine yellow (1 per cent. sol. in alcohol)	¼ fl. ounce.
Silver nitrate (10 grains to the ounce of water)	¼ fl. ounce.
Methylated spirit (industrial).....	5 fl. ounces.

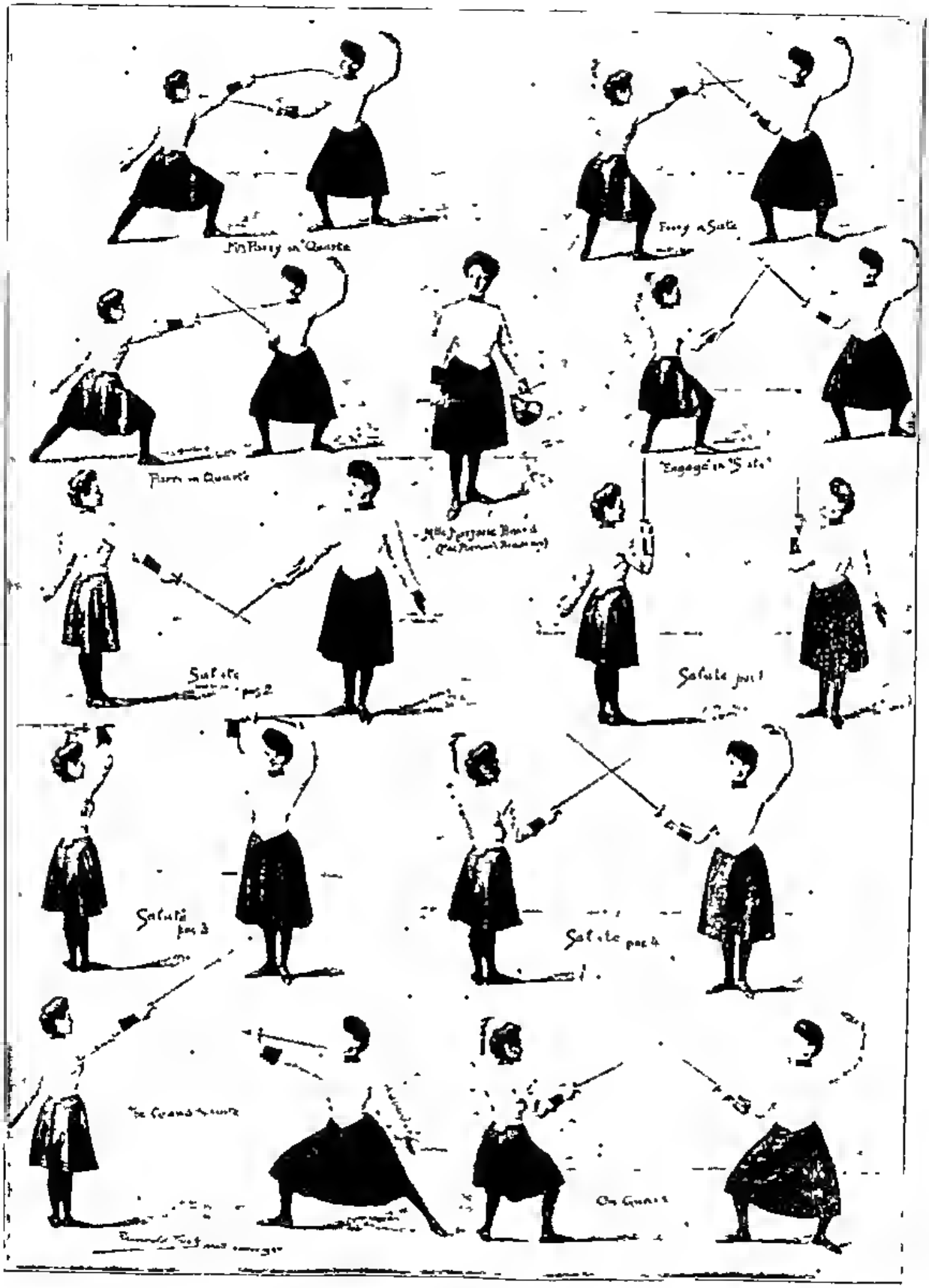
Dissolve the precipitate by adding, very carefully, one or two drops of ammonia whilst the solution is well stirred, being careful to use only sufficient ammonia to dissolve the eoside of silver.

Plates sensitized with silver eoside must be manipulated in a red light, and it is necessary to wash all traces of this solution, or the silver nitrate solution, out of the film after exposure and before it is placed in the developer. About two minutes washing under the tap is usually sufficient. The silver eoside solution is also used for the preparation of the red (pink) printer, and also for the preparation of yellow and green colour-sensitive plates.

For the blue (green-blue) printer a capital red sensitive plate may be prepared by flowing a very weak solution of pinacyanol in alcohol over the film for about two minutes. The best strength of solution to use is 1 in 50,000 parts of alcohol, and the dyed plate should be washed under the tap for two or three minutes before it is drained and exposed in the camera. Plates prepared in this manner may be safely manipulated in a fairly bright green safe light, and they do not require to be washed between exposure and development.

These plates may obviously be developed with any developer that is suitable for collodio-bromide emulsion, provided that the strength is adjusted to suit this process, and I have found the following hydrokinone developer to give excellent results.

THE ARTIST'S MODEL.



PHOTOGRAPHS BY REINHOLD THIELE

FENCING POSITIONS.

Wallage & Gilbett.

THE OLD MILL.

THE FREY PROCESS.

Design and Block by
JOHN SWAIN & SON, LTD

THIS process being a screenless method of reproduction gives plates of any reasonable size. Messrs. Frey & Sons, in Zurich, have cameras large enough for picture size 45 in × 35 in., or several subjects at once can be treated at the one operation and cost Larger sizes depend on the dimensions of the plant; the process would give any size with the same ease.

The plate we give (facing this article) is a good example of the process, though its merits are seen to better advantage in the numerous larger size plates we have seen.

Three negatives of the primary colours, blue, red and yellow, are first taken by a special method, which gives absolute guarantee for the same size of large plates.

The negatives bearing no screen allow direct retouching, and can, therefore, with little labour, be so much improved that they give a perfectly suitable copy on to the printing surface.

From each negative several copies can be taken for printing plates of different strength of colour through more or less exposure and different developing.

The three-colour negatives can be copied on to stone, zinc, aluminium or copper. The printing surface has to be coated with a special solution (the secret of the inventor) which produces a chemical grain. This grain can be varied in size and nature according to colour, size and quality of work.

The Frey process plates print remarkably well on hand-press or machine, and yield runs up to 50,000 from the same surface. An important advantage is that the printing can be done on cheap paper, plain or coated

Firms working this process can dispense with litho-stones altogether and use zinc. This material not only gives results even superior to stone or aluminium, but it is far cheaper, and on account of its thinness and light weight can be easily manipulated. A zinc plate 50 in.×40 in. costs 12s., aluminium £2, and stone of only medium quality £6. Zinc plates can be repolished with little cost and used over again several times.

The principal advantage of the Frey process is the enormous saving of artist's hand work. The cost of reproduction done by this process is at least 40 per cent. below the cost of the usual chromo-lithographic work. Any reproduction can be effected within fourteen days, and the results are superior to any other method.

There is a further considerable economy in the number of printings. Most of the reproductions done by the Zurich and London firms working this process have less than ten printings. Only paintings of exceptional richness and depth of colour require eleven or twelve plates, while six or eight printings give already quite satisfactory results in most reproductions.

Compared with lithography the Frey process requires only two-thirds the number of printings. The Frey process can be worked by any chromo-lithographer, who has taste and understanding for colour work, after a few weeks' teaching and training, and he can use all the secret solutions connected with this process without knowing their formulæ.

INJURIOUS MATERIALS USED IN PHOTOGRAPHY.

By E. W. FOXLEE.

Design and Block by
JOHN SWAIN & SONS, LTD

SEVERAL of the chemicals employed in the various processes of photography cause considerable inconvenience to some workers, while they may be used by others with apparent impunity. It does not follow that because a person may suffer from the use of one injurious chemical that he will from another However, it is well that at least reasonable care should be taken in the use of all that are recognised as being in any way hurtful, as prevention is at all times better than cure. There is an old aphorism "familiarity breeds contempt," and in many instances this applies to photographic chemicals, until some ill-effects are experienced; then it is recognised how easily they might have been avoided. Some of the things that may cause trouble will now be referred to

Ammonia.

This, as in the pyro-ammonia developer, when used much in a badly-ventilated dark-room produces, with some, nasal catarrh. The best preventative of this is better ventilation of the dark-room. The best remedy is, perhaps, occasionally smelling diluted acetic acid and now and then sipping a little vinegar, also taking as much outdoor exercise as possible. Should a Winchester of ammonia burst, as it may do in excessively hot weather if the stopper is firmly fixed, or one gets broken, the consequences may be serious if one cannot quickly get out of the room into fresh air.

Nitric Acid and Nitros Fumes.

Nitric acid is a highly corrosive acid. It burns the skin and chars the clothes, should any be splashed or spilled on them. Wherever this acid is used it is a good plan to have at hand a bowlful of a strong solution of washing soda, into which the hands can be immediately dipped. A bottle of dilute ammonia will answer the same end, so indeed will any alkali. If any of the acid be spilled on the clothes a little liquor ammonia quickly applied will prevent the fabric being stained or destroyed. When dealing with any strong acid it is well to have an alkali always at hand. It may seldom be required, but when it is, it is badly and quickly wanted. The nitros fumes given off where it is used in photo etching in ill-ventilated work-rooms, are injurious, causing irritation and inflammation of the lungs. The best preventative is thorough ventilation of the place, and occasionally taking a sniff or two of ammonia.

Collodion.

The fumes of ether have, at first, an exhilarating effect, but after a time a depressing one with sleepiness. The best preventative of the ill effects of the fumes of ether, or indeed any other volatile chemical, is complete ventilation of the rooms in which they are employed. The best and simplest remedy is plenty of outdoor exercise after the day's work is finished.

Cyanide of Potassium.

This is a most deadly poison, as every one knows, if taken internally, and there is no reliable antidote for it, as death takes place so quickly. The best is said to be the administration, first, of a dilute solution of carbonate of potash, followed quickly by one of sulphate of iron. But unless the antidote is given at once it will be of little avail, as the action of the poison is so rapid. The fumes of cyanogen, as given off in the fixing of collodion negatives, produce unpleasant effects with some persons, and are not healthy to any. I had a friend who could not remain for a quarter of an hour in a dark-room when it was being used without experiencing nausea and headache. If any of it happens to get into a cut, or abrasion of the skin, it produces a violent smarting, and I have heard of a case of blood poisoning being set up which resulted in death. Personally, although I have fixed tens of thousands of negatives in the collodion days with the cyanide, and have used it, I must admit, carelessly, cleaning the fingers with a strong solution or rubbing the stained parts with a lump of it, I have never suffered the slightest ill-effect from its use. But when I have felt any smarting through its entering a cut or scratch I have always taken the precaution of well rinsing the place under the tap and then sucking it for a minute or so. Fumes of cyanide may be greatly avoided by fixing the negatives in a dipping bath, as then only a small surface of the solution is exposed, also by taking the precaution of washing all the acid of the intensifying solution out of the film before the cyanide is applied, as the acid sets free cyanogen.

Bichloride of Mercury.

In the Daguerrotype days metallic mercury was employed in a heated state for the development of the picture, the fumes of which were very unhealthy Now, however, it is only the bichloride that is used in photography. This is also a deadly poison if taken internally, though not so quick in its action as the cyanide of potassium. The best antidote is the whites of two or three raw eggs, which, with the bichloride, forms an insoluble and, to an extent, an inert compound. So far as I am aware this salt has no injurious action on the skin.

Oxalic Acid and Oxalate of Potash.

Oxalic acid is a very active poison if taken internally. The best antidote is chalk, or whiting, and water which forms the insoluble and practically inert oxalate of lime. The rapidity in action of all poisons taken internally depends greatly upon the state of the stomach at the time it is swallowed. If it be empty the poison is rapidly absorbed in the system, and the consequences are quickly developed. Whereas, if the stomach be full, as after a meal, it is slower, and then there is the better chance of an antidote fulfilling its purpose. In any case when a poison has been swallowed medical aid should be immediately summoned after the antidote has been administered, which should be done as quickly as possible, and before the poison becomes absorbed in the system.

Platinum.

Those who do much platinum printing sometimes suffer from a skin trouble and also from nasal catarrh from the particles of the chemicals becoming detached in cutting up the paper. Recently, in one of the American journals, a writer gives a very simple remedy which he says is perfectly efficacious. It is to wash the hands and wrists two or three times a day in weak salt and water. This, he says, will quickly heal the sores. For the catarrh he recommends snuffing a warm solution of salt in water up the nose twice a day. This remedy is certainly a simple one, and if it does no good it will do no harm.

Metol, Amidol, etc.

Personally, I have never experienced any unpleasant consequence from these, but I ought, perhaps, to say that I have not employed them to any great extent—pyro being my favourite developer. The only preventative at present seems to be the avoidance of the solution coming in contact with the skin by doing the work in india-rubber finger-stalls, or india-rubber gloves. The next perhaps is, before commencing work, to well anoint the fingers with lanoline, well rubbing it in, and then wiping it off. This will to a great extent prevent the poison entering the pores of the skin. As a remedial, and to allay the irritation, the following is well spoken of: —

Carbolic acid.....	1 dram.
Wright's coal tar solution	½ ounce
Glycerine	3 drams
Water.....	12 ounces.

Bichromate of Potash.

Of the ill-effects of this salt, which is now so largely used in the various processes of photography, I can speak from painful personal experience. For years I worked with it with impunity, but at last it took effect. The first symptoms, and I now speak of my own case and that of others that have come prominently under my observation, is an itching on the backs and between the fingers, accompanied, usually, by minute watery pustules. The best remedy at this stage is to apply to the affected parts a little strong nitrate of mercury ointment—the "Unguentum Hardygii Nitrates" of the Pharmacopœia, which can be had from any druggist. The ointment should be applied sparingly, but well rubbed into the skin. With this treatment, if the use of the bichromate be discontinued, or the precaution be taken to do all future work in india-rubber gloves, probably no further trouble will be experienced. If, however, the work be continued without this precaution being taken, painful results will no doubt follow. The skin will dry and peel off in thin bran-like scales, and if the disease continues a thick crust will form on the backs of the fingers and hands which will crack when the fingers are bent. These cracks are sometimes deep and bleed, while the itching becomes almost unbearable. To allay this the following lotion is the best within my knowledge.

Glycerine	4 drams.
Carbolic acid (pure).....	1 dram.
Alcohol	5 ounces.

As to an actual cure, there is no known one, but if the use of the bichromate be discontinued, or the work done in india-rubber gloves, the disease will quickly disappear—nature will cure herself in two or three weeks. But it is a curious fact that when the disease is once contracted and apparently cured, it is liable, even years afterwards, to make its reappearance whenever the bichromate comes in contact with the skin. It is years since I suffered so badly, yet if I now work the carbon process for a few hours without gloves I feel the effects on the fingers shortly afterwards.

To avoid the ill-effects of the bichromate (which, by the way, does not affect every one, as I know some who have worked with it for hours daily for thirty years or more and have experienced no inconvenience from it) the best thing after the work is finished is to rinse the hands in dilute ammonia, then to well wash them in hot water, using carbolic soap and a nail-brush freely. If this were always done the risks of ill-effects from the use of the bichromate salts would be reduced to a minimum.

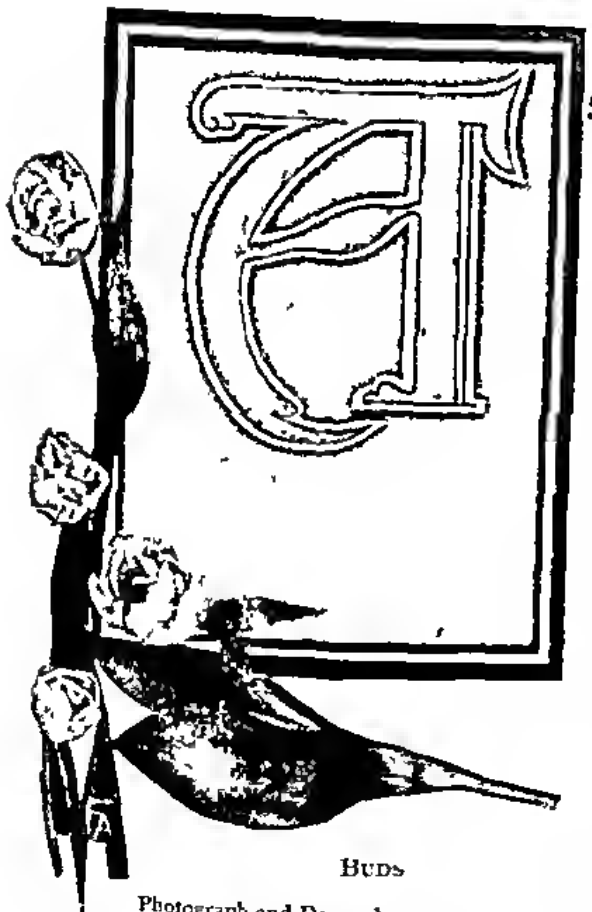
CHILDHOOD.

Marshall Engraving Co.

Reproduced from an Oil Painting.

SOME CAUSES OF FAILURE AND SUCCESS IN MODERN STEREOTYPING OF HALF-TONES.

By C. S. BEST.



BUDS

Photograph and Design by FRANK W. ADAMS

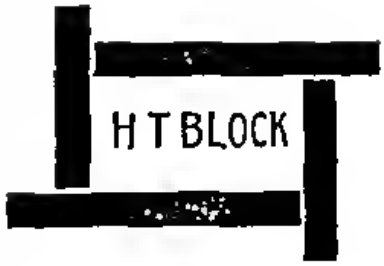
AS no doubt we are all aware, modern methods of coating the flong, adapted to the old groundwork of stereotyping, have placed in the hands of the trade, methods of making an unlimited number of duplicates from half-tone blocks, that for commercial quality and cost, leave little to be desired.

The most dominant factor that is left and *is* desired, is "Care," and that is a *prize only obtained after much searching.*

In putting it forward in this way, I wish to infer that the greatest number of failures in stereotyping as a duplicating method for half-tone blocks, is due to the lack of this rare quality. Of course, the less important necessities are good materials and *good methods.*

I will assume that we all understand the broad basis of the process, and touch on the points of failure and success, and the adjuncts thereto in rotation.

The mount of the block, for preference, should be of metal. If this is not so, and the blocks are in a forme, note the class of wood used for mounting. If of close-grained figured oak, or birch, pack the block until it is the thickness of a two-sheet card higher than "type high." If of mahogany or cherry, pack until it is a four-sheet card higher. If of canary, pack from six to eight-sheet card. If of a piece of pine, packed with straw-board, throw the mount away and get another. (This is not a joke, for I have actually seen in a printing firm, a block mounted on two quarter-inch pieces of common packing wood, glued together with strawboard between, to make to the correct height, and the poor photo-engraver received the undeserved blame that the block was not a good one !). So much for the mounting.



If the block be unmounted, place a three-quarter-inch planed iron slab, with strips of metal round, thus This will support the flong, and give a good, clean casting flange. (The reason, of course, for the packing, which is given approximately, is to allow for the shrinkage of the wood, whilst baking.)

The next factor, is the material used in the making of the flong. You, of course, buy from the best makers and take for granted the material is right, and when a stereo half-tone is found hollow in places about ¼-inch in diameter, the duplicating process receives blame as not being suitable. In reality, the blame rests chiefly in the quality of the paper used for making the flong which is to form the matrix.

In many papers, particularly the "blottings," there are small hard pieces of grit embodied in the paper, which will not "give" when the flong is dried and baked, thereby leaving on the matrix a minute raised portion or "pimple," which casts hollow. The same idea should be kept in mind, when the flong is being made. Small lumps of paste, pieces of dirt, and creases in the paper, form small places where the matrix is thicker, and therefore which obviously causes sunken portions in the resulting block.

The flong should be made with such care and exactitude as to produce, when dry, an exact thickness throughout. "Beating" is a much misplaced effort frequently used to get the tissue surface of the flong down into the etched block. This is not necessary. A simple "squeeze" in the press or casting box is quite sufficient, if the flong is faced correctly.

The flong should be coated or faced with one of the modern facing pastes, sufficiently thick to form the matrix. In this plastic surface, in exactly the same way that a block for electro is moulded, the impression or mould is taken; the difference being that, when it is moulded into the flong, it is held there by the press and baked. "Beating" only tends to break up the material with which the flong is faced, without accomplishing any better result than can be obtained by squeezing.

This brings us to an examination of the state of the flong, when ready for use. The surface should be about as hard as moulding wax used in electrotyping. If too hard, very great pressure is required when moulding. If too soft, too much pressure squeezes out the facing or coating. Baking should be carried far enough to thoroughly dry the matrix. A damp matrix will "cockle," and then you have to rely on the casting metal pushing it back into place, which it does not always obligingly do.

By the man of care, the casting box is always dusted, and the back of the matrix examined to see if there are any particles of grit, dirt, etc., adhering. Both of these need attention, or there will be more hollows on the cast.

To cull a now well-known phrase—"To be on our metal"—when casting, is just as important as all the other conditions.

Metal that is too hot, casts (to all appearances) solid on the printing surface, although the whites may look porous; the metal is very porous under the surface, and when the block comes to be printed, the pressure on the machine crushes the block unevenly, according to the varying porosity of the cast.

With some, another trouble is the peeling of the nickel facing. This is due to many conditions, the most frequent of which is, that through over-anxiety to get a good wearing surface, too much nickel, and too little copper, is deposited, the idea seeming to be that only the thinnest of films of copper is necessary.

whilst in reality, just a little more would be found to assist the nickel deposit in "holding on."

I have not discussed here the more abstruse technical details, but the more apparently simple ones, which are frequently "wolves in sheep's clothing." It is frequently in this very simplicity, in which the source of trouble lies, the idea being that it cannot be "that," which is so simple and obvious, but must be looked for in something that requires much delving and searching after.

It is to be hoped that a process so simple, economical and speedy, will not be condemned because we have not found the man to carry it carefully out in its details or because "this" or "that" is not being done correctly, which decides that the whole process is not suitable. Rather be it, that the man who cannot work it, is not suitable. If any person has made a success of any particular process, the process from that moment is correct, and faults found, are in the execution thereof.

On the following page we append illustration, showing accurately the difference between the old-fashioned tissue flong and the faced flong, showing its advantages over the old, in all classes of work.

The illustrations on the following page are actual photographic reproductions and casts *direct* from the actual matrices (flongs). Actual size of objects, not enlarged.

No. 1 is a half-tone on 200-line screen direct from an ordinarily made flong, consisting of the usual two blottings and three tissues, baked under pressure upon a piece of finely polished unetched copper, such as is used for making half-tone blocks

No. 2, a piece of the *same* flong, but faced with a modern stereo facing paste and baked under the same conditions as No. 1.

No. 3 is a nickel-faced stereo from No. 1.

No 4 is a nickel-faced stereo from No. 2.

No. 5 is a cast from the flong itself, reproduced in Nos. 1 and 3 This in the ordinary stereo is what is supposed to be a solid printing surface. Incidentally this partially shows the reason of the greyness of the printing in many newspapers.

No. 6 is a cast from the matrix illustrated in Nos. 2 and 4, faced with the paste showing a solid black as it should be.

Nos. 3 and 4 are stereotyped with a flong faced with the same paste as used in the other examples. A comparison of these with No. 6 will show the range of work possible in the finest of half-tone screens and a large solid surface.

All illustrations in connection with this article are by the courtesy of Messrs. Gilchrist Bros, Leeds.

PHOTOGRAPH BY VAN ZANEN

GOING OUT.

SPRING.

From a Water Colour by Tatton Winter R B A

The Grott Engraving Co.

Reproduced by [illegible]

A REVIEW OF COLOUR PHOTOGRAPHY.

By HENRY O. KLEIN, F.R.P.S.

"WILL IT MEND?"

Block by DEAN ENGRAVING CO

Photograph by R. BRAID

IT is a curious fact that the wish to reproduce colour by photographic means has led the majority of investigators to circumvent the actual problem by perfecting indirect colour photography, probably realizing that solution, purely photographic, is beyond their powers. There has been one exception, to which we owe Prof. Lippmann's momentous discovery of interference photography. Based upon the action of stationary light waves, laminated silver structures are produced, which are the cause of the brilliant interference colours in a Lippmann photograph.

Viewed from other than commercial standpoints, and overlooking the extreme delicacy of this process, Prof Lippmann may certainly claim credit of original research, the result of which came nearest to the much desired goal. Otherwise the Lippmann colour photograph is looked upon as an interesting curio. The colours are only visible if the plate is viewed at a certain angle, the metallic lustre and the uncertainties which beset the preparation of the emulsion being other formidable objections—and here direct colour photography ends.

If we consider how far the indirect methods have approached the ideal, we may be permitted to dispense with chronological order, and review the various processes according to their merit, striving to exclude personal like and dislike as far as possible

Undoubtedly the two greatest pioneers in colour photography are Frederic E. Ives, of Philadelphia, and Louis Ducos du Hauron The latter, long before the advent of three-colour photography, as we know it now, outlined with almost prophetic accuracy every known colour process right up to the present day, including that latest introduction the Lumière Autochrome plate. Although scores of years have passed since this ingenious Frenchman constructed his Melano-Chromoscope and printed on trichromatic carbon tissues, which were superimposed on a final support, a method of the most recent reintroduction, very little progress has been made in colour photography. The ways and means of getting results have been improved upon, rapid light filters and highly colour sensitive plates certainly forming mark-stones in the byways of progress, but they all serve to elaborate methods based on the principles of indirect colour photography laid down by a man who might have turned his inventions to immense commercial profit, but has been satisfied with the consciousness of having anticipated the discoveries of half a century.

PRACTICAL POINTERS IN WET COLLODION OPERATING.

By BURMAN NORTON.

A MEDALLION

Block by THE ARC ENGRAVING CO., LTD. Photograph by W. GILL.

IT is absolutely necessary for those practically engaged in process work to co-operate with the Editor in his endeavour to make the current volume as interesting and instructive as the preceding volumes. My article will be instructive to the elementary student, although the advanced operator may appreciate the practical points. Indeed, some may be known to him, but it is for the benefit of the less experienced members of the "craft" that I give these hints.

As there are often times when work is wanted to be put through with celerity, the chemicals and bath seem all out of gear—which means trouble—the bath, generally, coming in for the full amount of blame, although quite innocent of the many faults laid to its account.

The operator takes out the bath in use, brings in a fresh one, filters and acidifies, coats another plate, sensitizes and exposes, and develops in the usual way. Upon examination there will be found fresh troubles in quite another direction, the time has been wasted, and—still there is trouble.

Knowing and foreseeing these *avoidable* difficulties of wet-plate operating, I shall endeavour in this article to help those operators who get what I may term a "trouble day" more often than they care for. The hints will be more or less brief, as I assume that my readers have a fair experience of wet-plate manipulation, and it would be impossible to go into all details unless a text-book on the wet collodion process were to be written.

The procedure advocated for the practical adoption of operators who wish to make operating reliable, and to eliminate most of the difficulties which beset the process, I will give in detail.

Firstly, have nothing in your dark-room but the essentials, *viz.*, silver bath, collodion, developer and cyanide; the intensifying, cutting and blacking to be done in another sink, but not in too close proximity to the dark-room.

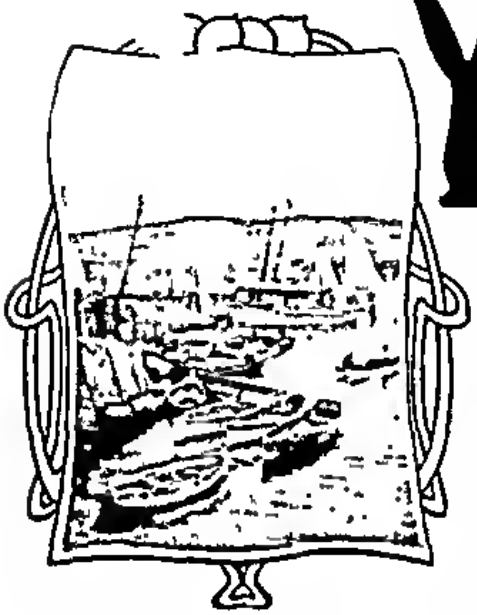
Secondly, use a dipping bath, size 18×16, which has a solution capacity of 250 ozs.; make up bath to 40 grains per oz. The flat-dish silver bath is not a good substitute, as it holds a comparatively small amount of solution, which is detrimental to the uniform sensitizing of the plates, changing its sensitizing properties with the immersion of every collodionized glass, and having a tendency to get greasy quickly owing to the small amount of solution. Another disadvantage is the large surface exposed to the atmosphere; the temperature

A LOVE GAME.

Burman Norton.

AUTOCHROME AND OTHER COLOUR PROCESSES.

By JOHN S. SUNDERLAND.



IN HARBOUR
Port Erin, Isle of Man

Engraved by CARL HENTSCHEL, LTD. Photograph by WM. P. THOMSON

YET one more process of colour photography—the Lumière Autochrome system—this time really in colours. Now that true colour positives can be obtained, the printing world is asking what effect will the process have on three-colour printing? What are the advantages of the new process? All must readily admit there is a wide range of usefulness in the Autochrome plate; primarily, as a guide in reproduction in the three—or four-colour—processes. This, in itself, is a great help and saving of time in correcting plates when the original is distant from the studio, where colour-plates are made. But as yet awhile there appear to be difficulties in the direct use of these colour positives, it is not good policy to discard altogether the three-colour negatives at present in vogue. Rather it will be advisable to experiment as much as possible with these Autochrome plates as copies for translation into colour blocks. It will be found that to obtain successful results alterations will have to be made in the density of the colour filters. This will largely depend upon the character of the Autochrome positive. Though there is little doubt that when the intelligence that is displayed in colour-block making is applied to making blocks from these natural colour photographs, it will not be long before we may expect to see delightful reproductions of flowers and fruit, as well as many other subjects that will gladden our eyes with the charm of colour.

The application of this new colour plate to various operations in lithography will also be exceedingly useful, even if only for a guide in copying where photography is not at present used. Altogether, whatever may be said to the contrary by ordinary photographers, who are not perhaps well acquainted with process engraving, the new colour photography is undoubtedly remarkably interesting and useful, with many advantages at present unknown to the man in the street.

The three-colour reproduction facing this article is made from negatives taken direct from the colour positive. It is not inserted as a specimen of three-colour work, being the first attempt at reproduction (on our part) of the Autochrome plate. At the same time it will serve to show the possibilities of the process.

It is admitted that the three and four-colour processes under ordinary conditions are very useful methods of reproduction, yet it is frequently found that want of originality is lacking. Some originals cannot possibly by reproduced satisfactorily by the ordinary methods, yet it is only occasionally that a departure is made from the usual procedure.

corresponding to the degree of light transmitted through the positive, at th other end, thus getting a negative at the receiving end of the wire.

I give herewith two line blocks of a print from a negative obtained in thi way, Fig. 1 being actual size as telegraphed, and Fig. 2 reduced so that the line are not so noticeable.

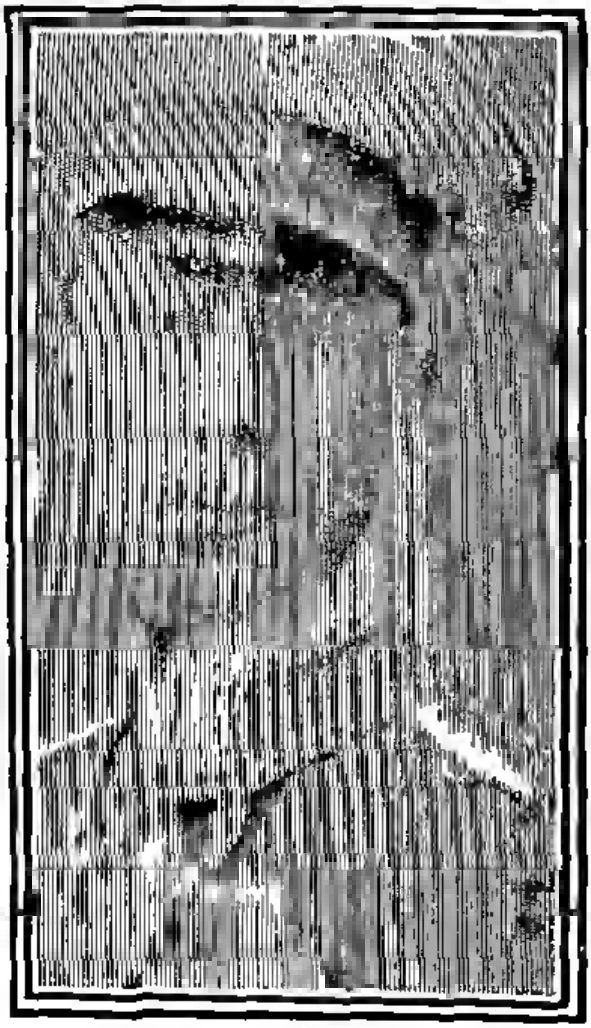
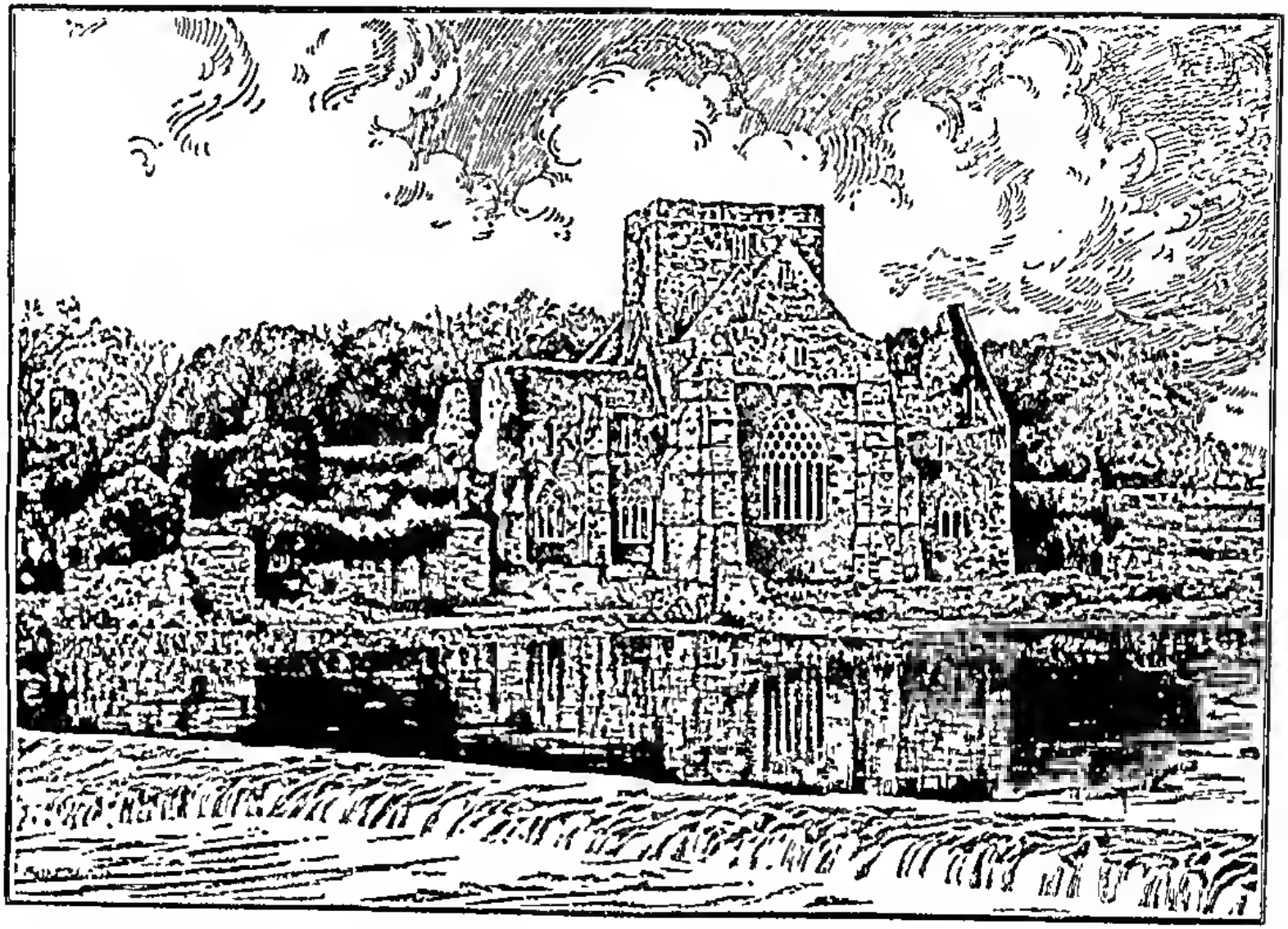


Fig 1 Same size as telegraphed

Fig 2 Reduced to half size

The photograph from which this block is made required about twelve minutes to telegraph. The film was then developed, a print obtained and a block made within an hour of starting to transmit the photograph, thus being able to publish a photograph a day earlier than would otherwise have been possible.



PHOTOGRAPH BY R. WELCH

HOLY CROSS ABBEY.

(Printed from an Electro)

W. & G. Baird, Ltd.

Austrian method of biting in successive baths was afterwards adopted with improved results, the strength of the baths being usually 45°, 40°, 36° and 27° Beaumé.

Rebiting.—If the plate was insufficiently bitten, it was rolled in carefully with a composition of

Spermaceti	200 parts.
Stearine	100 ,,
White wax	80 ,,
Asphalt	40 ,,

the plate heated to melt the composition and then rebitten for a few seconds with a weak solution of perchloride at 1 or 2 per cent., the operation being repeated as often as necessary, gradually increasing the time of rebiting

We found practically little difficulty in working the process all the year round, the temperature in the hot months being always between 80° and 90° in the room and sometimes over. The worst time was in the rainy season, from June till October, when the air was not only heated, but saturated with moisture. The proportion of bichromate in the sensitizing solution had to be reduced and that of the ammonia and alcohol increased to a maximum. The process was found most useful for all kinds of delicate half-tone or line work, with the great advantage over collotype of offering facilities for making additions or corrections, either on the copper plates with burnisher and roulettes, etc., or by working on the negatives and transparencies. Graduated tints could be added to skies, and etched flat tints to town plans, etc. We could also print in colour, either two or three different colours on a plate, as in reproducing stained photo-micrographs; or by separate printing as in chromo-lithography. The natives learned the printing of these plates very readily, and we generally used cold inks, so that no heating apparatus was necessary.

In reproducing subjects for photogravure, we generally preferred to use gelatine dry plates, as we found that they reproduced delicate half-tone much better than wet collodion plates. When orthochromatic plates had to be used they were prepared by bathing "Ordinary" plates in a bath of erythrosin and silver nitrate prepared according to Mallman and Scolik's formula, and latterly ammonium picrate was also added. We also found the photogravure process very useful in producing delicate enlargements from small negatives, details often appearing that could scarcely be seen in the originals.

I have only to add that the process was worked out to a very large extent by the late Mr. A. W. Turner and to whose skill, ingenuity and readiness of resource the success we attained was mostly due.

MACHINE ETCHING IN A COMMERCIAL SHOP.

By E. M. GILL,

President, Gill Engraving Co., New York

EVER since etching machines began to be used in some of the newspaper shops in this country we have read from time to time, and been hearing more or less all the time, about the acid blast and other etching machines. Of late these devices seem to have become more and more a prominent subject of current trade talk, although, so far as we are aware, they had been adopted in only a few commercial engraving establishments, and appeared to be good only for daily newspaper etchings, where quick work was the main thing all the time.

Although much was claimed for the new way of etching as to the quality of the work produced, the main consideration urged in its favour appeared to be the saving of time by it. This, though important enough in itself, is nothing in a commercial shop compared with having the work up to the highest point in quality. Anyway, after long hesitation, and under the pressure of necessity for increasing the facilities of our zinc etching department, we concluded some months ago to try etching by machinery, as an alternative to lengthening our array of rocking trays by trespassing on the adjoining workrooms. A competent man was accordingly sent out to investigate the machines in use in New York, Philadelphia and Boston, and on his report we finally concluded to instal a Levy Acid Blast to start with.

The thing has been a revelation to us. Of its quickness we had heard enough to make us expect all it could possibly do in that direction, but our main concern was about the quality of the work produced, and in this respect we have been most agreeably disappointed. The machine was put

ZINC PLATE ETCHED BY LEVY ACID BLAST

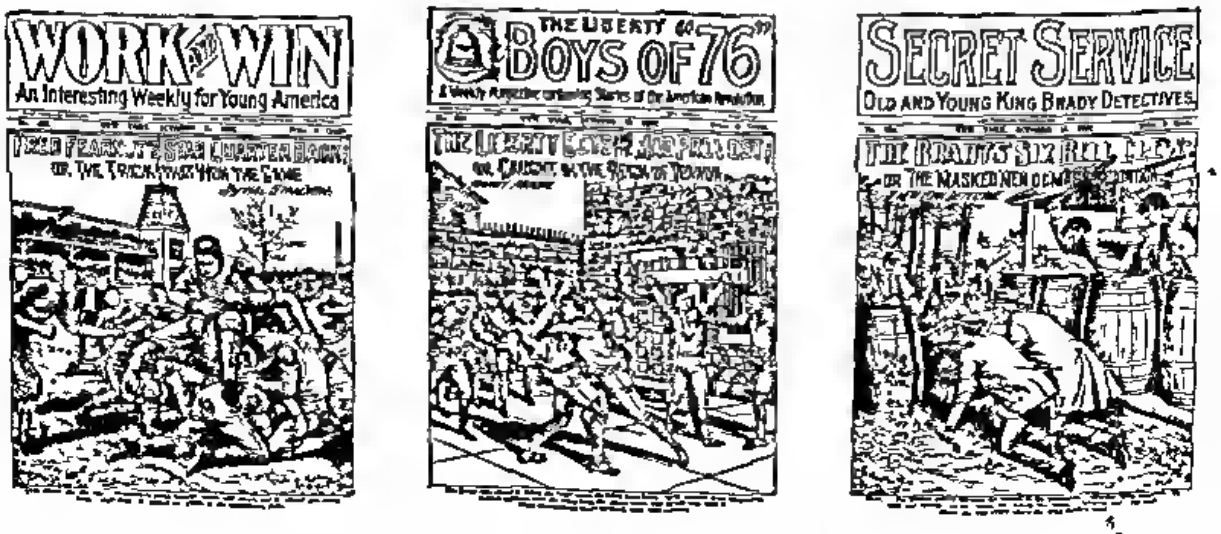
One bite, done in 40 seconds

in with the view first of all to have it handle the coarser and less exacting run of work, but it soon became apparent that it was good for better things than that. In fact, we found that the work etched by the blast had about it a quality of excellence, a cleanness of line and dot and stipple, a depth in the fine spaces, in short, a tone of nicety that equalled a blue print proof of the negative, a result but rarely if ever fully attained by the old way of etching.

No less surprising to us was the readiness and even avidity with which our workmen took to the machine. We had expected more or less trouble in this regard, but a bright, intelligent young foreman's assistant set the pace by taking hold of the machine and showing up what he could do with it. He got every plate all right from the very start, though some of his fellows have once in a while lost a plate, generally through over etching in the first bite, which we restrict, at least on fine work, to not over forty seconds with a half-pound blast. Three bites are enough for most work, but on very fine subjects we prefer to give four.

The machine has easily replaced four etching tubs, and we are now waiting for a second one. Meanwhile we have put in a Levy Etch-powdering Machine, and have it running. This machine can best be described in the words of the man who is operating it, as "the greatest thing that ever happened." While the acid blast is remarkable for the novelty of its etching process, the powdering machine impresses one by its automatic working. The powdering process, as a purely mechanical operation, might easily be supposed to lend itself to being done by machinery, and also, as in most such operations, to being done better by machinery than by hand. But this machine not only powders the plates more quickly and leaves the ground cleaner than can be done by band, but it also heats and cools the plate without its having to be touched by the workman, and the contrivance is altogether as ingenious as it is efficient.

The importance of these improved methods of working to the future growth of our art industry can scarcely be over-estimated. They strengthen its foundations and afford a basis for its wider spread. As in the case of our sister arts of lithography and printing, the more facile our processes the busier we will be.



Zinc Plate Reproductions of Magazine Covers, Etched by Levy Acid Blast.

Gill Engraving Co. *Three bites and two powderings, done in 25 minutes*

PHOTOGRAPH BY ALFRED ELLIS & WALERY

SWEET AS THE ROSE.

Sedgwick, Ltd.

INTAGLIO PRINTING PLATES AND THE METZOGRAPH SCREEN.

By R. B. FISHENDEN,

The Municipal School of Technology, Manchester

DADDY.

Engraved by CARL HENTSCHEL, LTD. Photograph by REINHOLD THIELE

INTAGLIO printing plates for the reproduction of originals in gradated tone may be divided into two classes, the first of which is represented by the Talbot-Klič photogravure process, and the second by the cross-line intaglio half-tone. In the first class the image is produced on the copper from a transparency, the resist being a negative print taken from the transparency by the 'carbon' process and transferred to the metal. In this print the tones are represented by varying thicknesses of gelatine; a grain is necessary which may either be of bitumen laid on the copper, or a screen may be used to produce on the metal surface separate ink-bearing cavities. Whatever form of grain is used the etching takes place through the thickness of the carbon print resist and the resulting plate yields differences in intensity of tone by reason of the varying depths to which the plate is etched, control is exercised by the difference in thickness of the gelatine in the carbon-print resist, the area of the cavities being practically the same for different tones. In the second class of process the method of working is entirely changed, a transparency is prepared and the grain is obtained in the operation; for instance, in the case of cross-line intaglio half-tone a transparency is made in which the different gradations are represented by opaque dots of varying size; from such is then produced on the copper a print by the enamelline process which is etched in a similar manner to a relief half-tone plate; in this case the area and not the depth of the etched cavities controls the tone—different tones may be etched to varying depths, but this is of secondary consideration. Assuming plates to be prepared by the two methods, both of a similar fineness of grain, the character of the prints will be different and that produced by a process coming under the first class will be the more pleasing. The area of the cavities being similar, the grain will not be so apparent as compared with the pictures produced by the second process where the effect of the regular ruling is very noticeable. For this reason intaglio half-tones prepared by the second method have never been very successful. The Wheeler metzograph screen, because of its particular character, has rendered the making of plates by the second class of process successful pictorially because the effect of the grain corresponds to that produced by bitumen dust in the photogravure process and

this is not so easily detected as the grain of cross-line half-tone intaglio plates, the resulting effect being more gratifying to the eye.

It is necessary to distinguish between an intaglio half-tone having ink-bearing cavities of different areas and machine-printed photogravure, where the screen is usually used merely to divide the tones into separate cavities, the plate being prepared according to the principle involved in the first class of process mentioned

The accompanying illustrations are from low-power photo-micrographs, showing the essential difference between Talbot-Klič photogravure and intaglio plates prepared from Metzograph screen positives. Fig. 1 is a portion of a photogravure plate, and the bitumen grain shows itself practically even in size throughout, whilst the etching is to varying depths, giving the appearance of the hills and valleys of a physiographical relief map. Fig. 2 is a proof from the same portion of the plate, illustrating the manner in which the plate holds ink

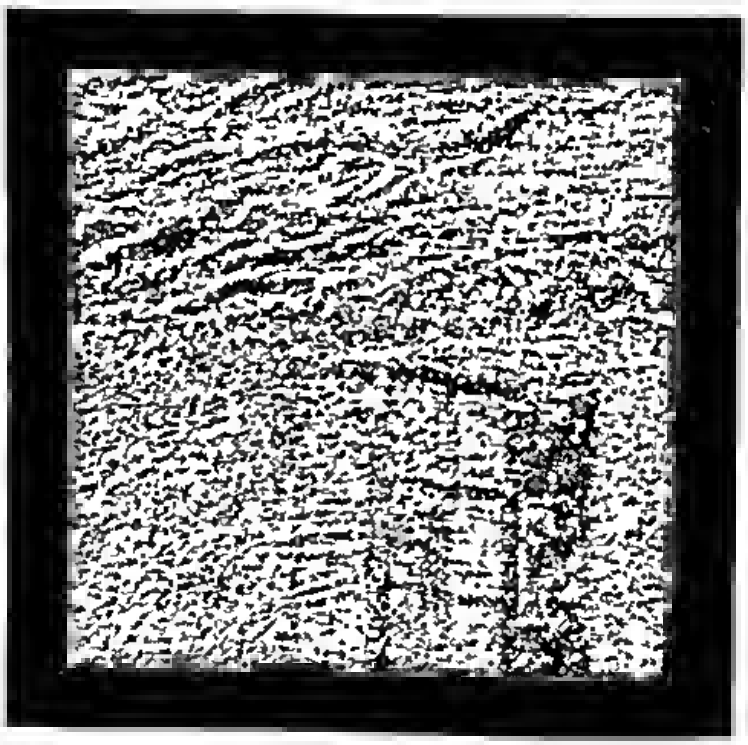


Fig. 1.

according to the depth of the etching. Fig 3 represents a metzograph intaglio plate and the difference to Fig. 1 is very marked; the lighting is arranged so that the polished metal shows white against the etched surface, the varying area of the cavities being quite distinct. Fig. 4 is a proof from the plate.

The method of making intaglio plates with the Metzograph screen can be utilised in some cases in place of Talbot-Klič photogravure and has the advantage that the work can be carried out by any competent worker in half-tone without the particular photographic knowledge which photogravure demands.

Mr. Wheeler has recently perfected some special screens for the work, which I have had the opportunity of testing; these are very easy to use considering the extreme fineness of the 'grain.' Pleasing results can also be obtained with the usual screens yielding a grain corresponding to that produced with sealed cross-line screens of about 150 lines to the inch.

As regards the actual work—the first operation is the making of the Metzograph transparency, which is done in the camera from any suitable negative, either an original dry plate negative or a 'copy' negative from the subject to be reproduced. In any case the negative should have a short range of gradation —that is to say, it must be 'flat.' If a vigorous negative be used, a proof from the resulting etched plate will have an objectionable "mealy" appearance, owing to the fact that the transparency cannot be made of the necessary character. The negative is supported in a 'transparency' board and may be illuminated by light reflected from a sheet of white paper. The screen must be placed very close to the plate if it is of a fine grain, although the minimum distance ($\frac{1}{32}$ inch)

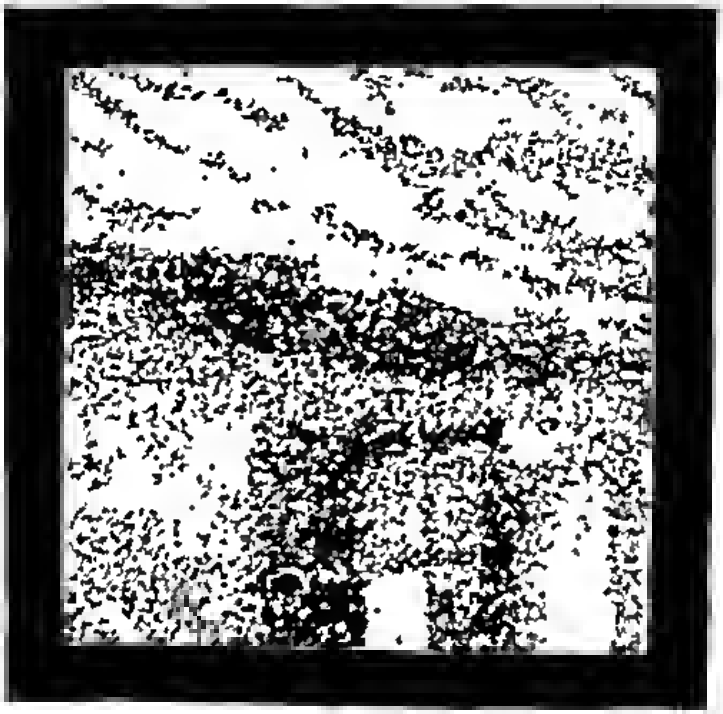


Fig 2.

suffices if a stop is used not larger than //45. When working with two 220 volt. arc lamps taking from 10-12 ampères, reducing to $\frac{3}{8}$ scale, an exposure of from 1½ to 2 minutes will be necessary. The aim should be to make a flat transparency, the shadows (corresponding to the high-lights in a negative) allowing for a fair amount of grain to print, the high-lights having sufficient strength to print cleanly. Only in very exceptional cases is it advisable to keep any pure whites in the etched plate. No reduction of the transparency is usually necessary and one intensification with copper bromide and silver nitrate usually yields ample printing density, although it may sometimes be advantageous to blacken with sodium or ammonium sulphide. Fig. 5 is an enlargement of a suitable transparency showing the full range of tone

Ordinary half-tone copper may be used, but charcoal, emery or pumice powder are quite unsuitable for the polishing, because the minute scratches resulting will

hold ink when the plate is being proved. A piece of copper should be selected free from scratches, and cleaned with ammonia and whiting from which all grit has been removed by washing. The copper may be specially polished and any scratches removed with a swans' down 'buffer,' fitted to the spindle of a saw bench, the buffer being charged with a small quantity of buffing rouge which is a mixture of rouge and hard fat.

The printing is carried out in the ordinary way, but it is well to work with a rather thinner enamel than usual The following formula will be found suitable.

Fish glue	75 c c	3 oz.
Water	150 c c.	6 oz
Am. bichromate, 20%	50 c c	2 oz.

After printing and burning in, the margins of the plate must be thoroughly protected, because they form the white plate-mark and are not removed as in the case of ordinary relief etching The plate must be quite free from scum before the etching is commenced; acetic acid and salt may be used for cleaning, but a weak solution of ferric chloride, which is sometimes used for the purpose, must not be applied, because the slight etching would probably be deleterious. The etching of the plate is simple, but it is at this stage that mistakes are most likely to be made. For ordinary subjects, a two minutes' etch should be given in a ferric chloride bath 38° Baumé, etching face downwards, and afterwards the plate is removed from the solution and the ferric chloride applied locally to the deepest tones with a brush to impart a richness to the shadows—experience will show how far this local etching should be carried If the plate contains any light delicate tones, such as a cloudy sky, the etching should be stopped for that portion in 30 seconds. A common mistake is to etch too deeply for light tones; it should be remembered that the shortest possible etch will hold sufficient ink to print the depth of tone required.

A first proof may be taken without the enamel being removed, so that any further etching can be done if it should prove necessary; when the etching is completed, however, the enamel is removed and then any burnishing required to lighten a particular portion is done. Here again, care is necessary for even a light rubbing in the lighter tones makes a considerable difference by reason of the shallowness of the plate.

The proofing requires care and some experience, but no more than is necessary to make a transfer from an intaglio copper plate. A copper-plate press is desirable although a litho press may be used for

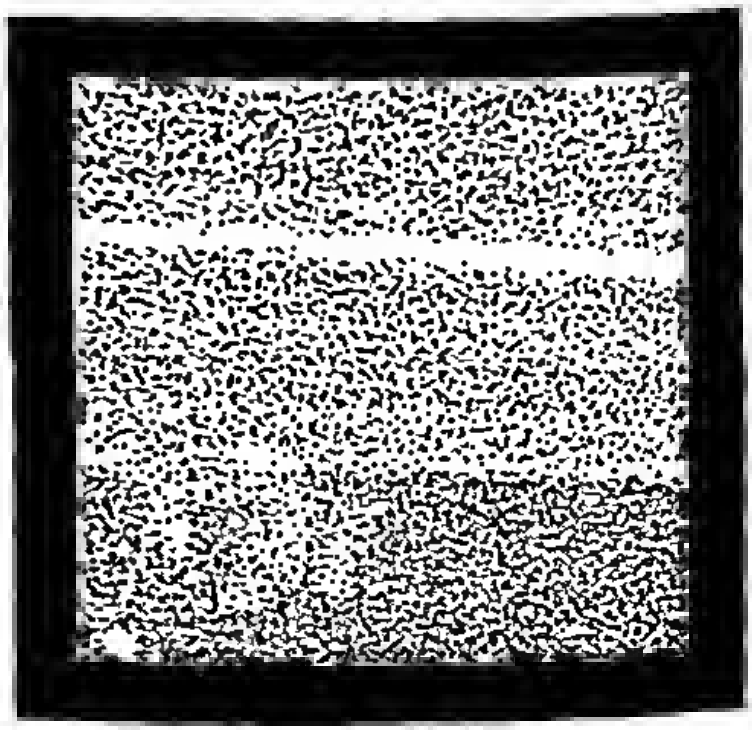


Fig. 3.

TEMPLE OF PALLAS, ROME.
(From a Coloured Lithograph)

The Half-Tone Engraving Co., Ltd.

Inks by C. Lorilleux & Co.

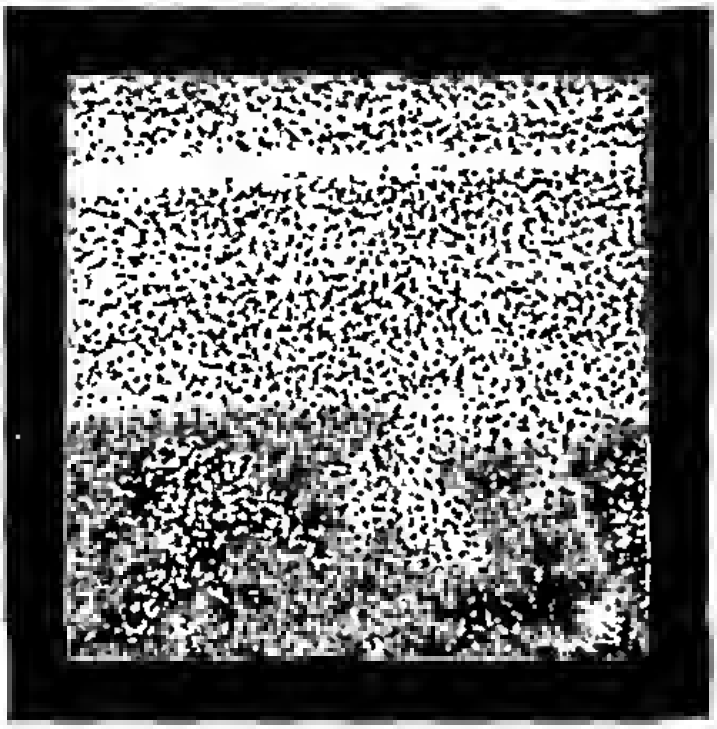


Fig. 4

a trial proof. Photogravure ink is the most suitable for use and this is worked into the plate with a dabber, after which the surface of the copper is carefully cleaned, either polishing it or leaving a slight film of ink behind which mellows the tone of the print. The paper, which should have been previously damped in a damping book, is then applied, the two surfaces are then put through the press under a soft blanket pressure. A soft sized paper is the best to use and special attention should be paid to the amount of damping—if too dry the grain of the plate will show hard and crisp, whilst if too damp, the proof will be flat and dull; a suitable amount of moisture will yield a mellow proof, which will at the same time be brilliant. Before printing an edition the plate requires bevelling after the manner of a photogravure plate, in order that the edges of the copper will not cut the paper, which will be done by an outside firm. The plate will yield up to twenty copies or more without showing any signs of wear, but it is preferable to have the copper steel-faced, as is invariably done in the case of photogravure, thereby prolonging the life of the plate indefinitely because the steel-facing can be renewed whenever it may become necessary to do so.

There is quite an untouched field for this class of work amongst photo-engravers. The making of souvenirs and book-plates could be done in rather a novel way and in addition the method is very simple and economical. The printing would be entrusted to a firm dealing with this class of work.

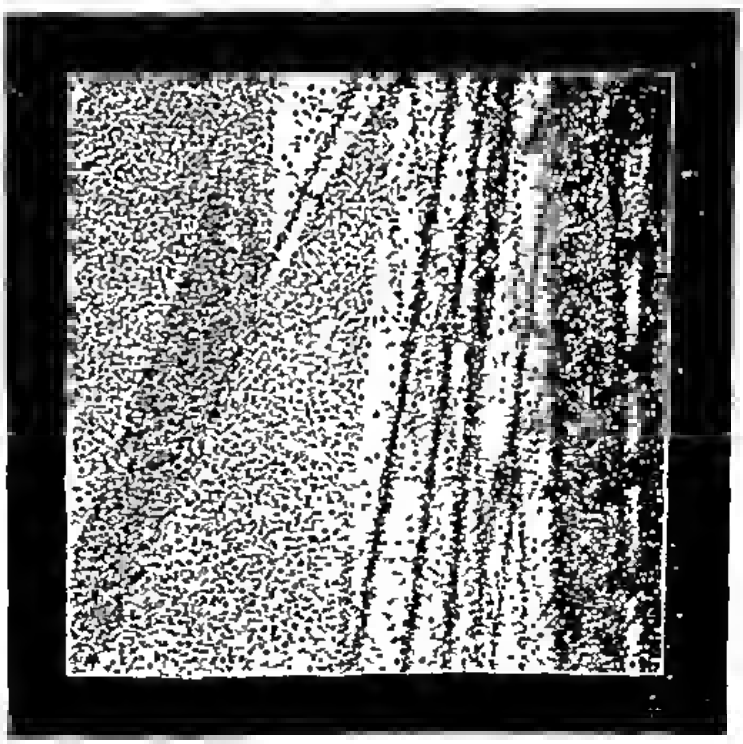


Fig 5

THE EXPERIMENTAL BASIS OF THE THREE SENSATION THEORY OF VISION.

By A. J. NEWTON and A. J. BULL,

Of the L C C School of Photo Engraving and Lithography

Design and Block by the
L C C. School of Photo-Engraving
and Lithography.

THE only generally accepted theory relating to the mechanism of vision is that which supposes all our sensation of colour to be derived from the stimulation in whole or part of a set of three sensitive receivers, each of these being stimulated by a different series of wave lengths, and giving rise to different sensations, which we call colour. The three series of waves to which these receivers respond, although differing in their maxima, nevertheless overlap considerably.

The evidence adduced in support of the theory outlined is briefly as follows:—

1. The General Appearance of the Spectrum.

This to normal eyes looks composed of three series of allied hues, *i.e.*, red, green and blue violet. The variation of the hues contained within each region is very gradual, as from deep red to an orange, or blue to violet, while in the intermediate regions, which are comparatively narrow, change of hue is much more rapid.

If we compare the reception by the ear of vibrations which arouse the sensation of sound, similar differences in vibrations produce similar differences in tone, all the way along the audible scale, indicating that in this case there are a great number of separate sensitive receivers, while the broad regions of similar hue observed by the eye are apparently determined by having few receivers sensitive over comparatively wide ranges.

2. The Primary Colours.

The fact that white and all colours can be accurately matched in hue by three colours, either alone or in suitable admixture The colours for this purpose may be quite narrow spectral regions, but they must be taken from the red, green and blue. The only exceptions to this are possibly one or two pure spectrum colours, which it has been stated require very slight dilution with white light before they can be matched.

3. The Sensation of Yellow.

The fact that yellows of totally different spectral composition are indistinguishable by the eye. The composition may be either of the following, (*a*) pure spectrum yellow, (*b*) a mixture of small regions of pure green light and pure red light, (*c*) a mixture of all light from the extreme red up to the blue-green. In each of these cases the yellow is produced by simultaneous excitation of both the red and green sensation.

4. Colour Blindness.

Abnormality of colour vision can in all cases be directly accounted for by variation in amount of the three sensibilities. Thus the phenomena is due to the partial or complete absence of one or possibly two of the sensations; for example, persons having no red sensation cannot distinguish between bright reds and dull browns, or between greens and yellows. Another aspect of the same phenomenon is that shown by the fact that different people see the colours of the spectrum intermediate between the primaries in slightly different position, thus the same wave length may be orange for one person, yellow for another, and yellow-green for a third.

5. Choice of Three Printing Pigments.

The fact that it is possible to make subtractive three-colour prints, follows indirectly from this hypothesis. Here each pigment must absorb one primary from the white light falling on it. The efficiency of the reflection or transmission of the other two primaries determines the facility with which all colours may be imitated No other three pigments but three absorbing respectively red green and blue-violet, can possibly produce certain colours. If, for example, pigments reflecting the primary coloured lights were used (red, green and blue-violet) it would be impossible to produce the effect of bright compound colours like yellow and blue-green. This is really a secondary argument, for three-colour printing depends immediately upon the manner in which the eye sees the spectrum of white light, although it may be considered apart from the reasons as to why the spectrum is so seen.

6. Variation of Hue with Brightness.

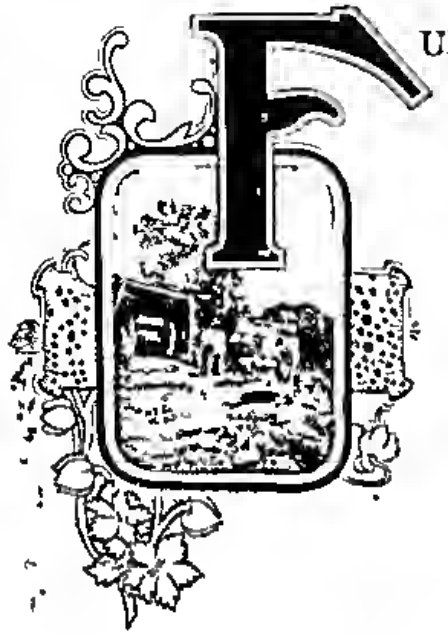
If we have a colour stimulating two sensations in unequal amounts, the increase or decrease in the brightness will produce a change in hue, unless the two sensations vary in exact proportion to each other, which can seldom be expected. An example of this is well seen in certain blue lamps, which when very bright look reddish, and when darker look bluish, so that the light seen directly through the glass looks crimson, while the duller surrounding space is blue. The blue glass transmits a little red light, and when the illumination is very bright the blue sensation begins to reach its maximum stimulation, while the red is still increasing.

7. Other Evidence.

Experiments *ad hoc*, such as Maxwell's discs, Maxwell's colour box, and so on, always confirm the theory while we are not aware of any authenticated experiments that can be repeated, to discredit it.

THE DARK-ROOM.

By W. T. WILKINSON.



Designed and Engraved by W & G Baird, Ltd

FULLY seventy-five per cent of the troubles met with in negative making for process work are caused by working in a dark-room that is dark in a visual sense. This is a mistake: the photographer's dark-room should be as visually light as it is chemically possible to make it; instead of colouring the walls with black or brown pigments, walls and ceilings should be white, and the benches covered with *clean* white paper.

In such a room, illuminated with safe light, work will be easier, and the defects entirely minimised.

The floor of the room should be covered either with a light chequered pattern of linoleum (easily washed), or with a cement similar to the floor in the new electric trains on the Metropolitan, also easily kept clean.

Safe lights can be purchased in many forms to suit every personal requirement, and with one exception cheaper than can be made at home.

The exception is, to put a six-inch circle of sheet lead in the reflector carrier of an incandescent lamp, then place the lamp (a 16-candle power) in a beaker, just large enough to take it, and immerse the beaker in a jar containing a solution of an aniline dye.

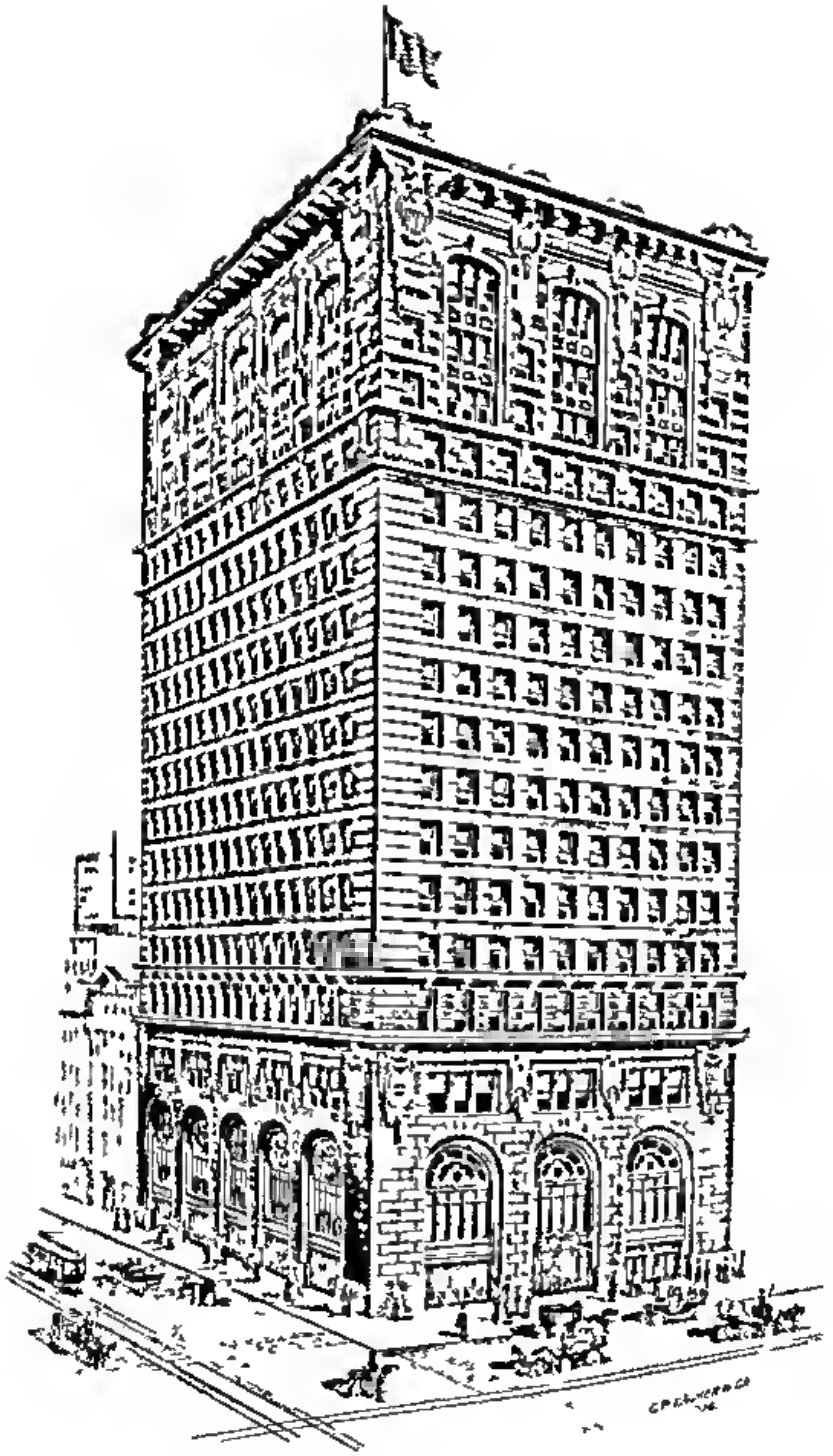
For red, a saturated solution of coralline, or of Phthalene, or of croceine scarlet For green, a solution of malachite, or emerald green For orange, saturated solution of fluorescence, or filter K. Three such lights, placed on a shelf out of the way of everything else, each with its own switch, will enable the operator to have just the light required at a second's notice.

At first sight, the idea of having the walls, etc., of the dark-room white seems wrong, but why should it. Light does not emanate from the walls, etc., they only reflect, and if the light they are allowed to reflect is safe, mere reflection cannot make it unsafe. The dark-rooms fitted up in this manner, always in the teeth of great opposition, are now acknowledged to be ideal; operators, groping about in a real *dark* room, spoiling negatives and breaking measures, should think this over.

ETCHING BY C. O. MURRAY, R.E.

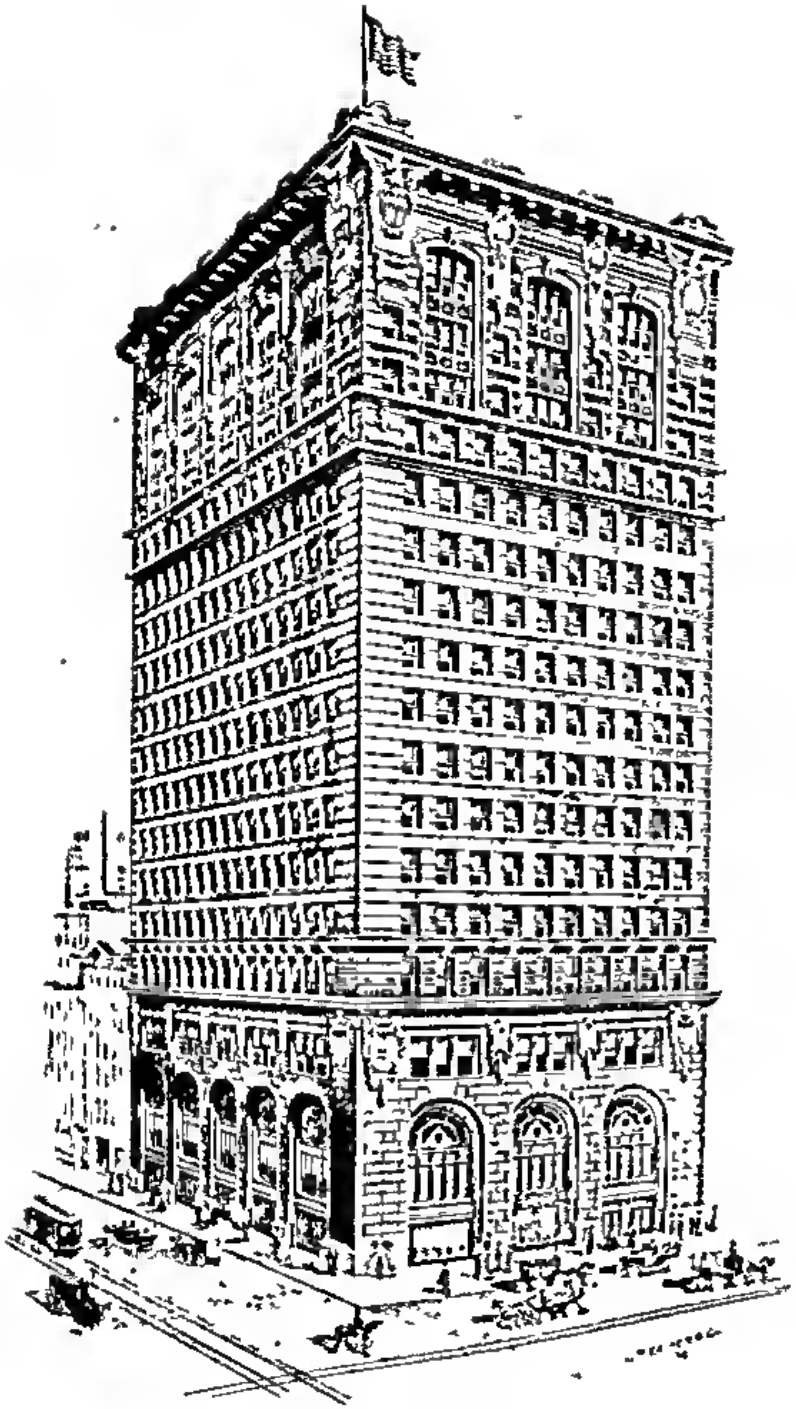
THE CURFEW HOUR.

(By permission of The Art Journal.)



A CHICAGO SKYSCRAPER.

C. P. Zacher & Co.



A CHICAGO SKYSCRAPER.

(Albert Galvano, from the Original Block on preceding page)

Eyre & Spottiswoode.
(Electro Department)

A COVER DESIGN.

REPRODUCING LACE.

By ERNEST MARRIAGE, F.R.P.S.

THE process worker who has to make half-tone blocks of modern lace for use in trade catalogues will probably work direct from the examples, in preference to the more round-about method of first obtaining a photographic print of the lace, and from that making the half-tone block. It is not, however, always practicable to do this when old laces have to be reproduced; the photographer must go to the lace, as the specimens, if in museums, will assuredly not go to him. I have recently had some illustrations to prepare from old laces in the Victoria and Albert Museum at South Kensington, as well as from modern laces which could be photographed at home, and my experience may be of service to others.

Design and Block by
L C C School of Photo-Engraving and Lithography.

There is no need of an elaborate camera. The back and front should be at right angles to the base, of course, and focussing should be done by racking the back, as in all copying work. A rising and cross front is a convenience. The lens, however, should be a good one, an anastigmat; then, as the objects are flat, there is no need to stop the lens down. The greater its focal length the better, provided the camera is capable of extending to twice that extension. The only unusual piece of apparatus that is needed is a tilting table; it is always a matter of surprise to me that so few photographers possess one.

Generally speaking, photographs of lace should be made natural size, as any alteration in scale affects the character of the result. This is not always practicable; the repeat of the lace may be too large for the plate, or a general view of a lace article, such as the lace collar reproduced in Fig. 1, may be wanted. In such cases, a detail photograph natural size should be taken, as well as the reduced negative.

The quickest and best way to set up the object, to use an Irishism, is to lay it down on the floor near a window. The lace should be laid on a dark background; a piece of creaseless black paper over a drawing board answers well, but the paper should be a dead black free from shine. If the lace does not lie flat, a piece of patent plate glass should be placed on the top of it. The camera should be treated as if it were a fixed-focus instrument, set at double the focal length of the lens to be employed. Take two post-cards, place one in any handy position, and by moving the camera and racking the back in or out, get the image on the screen the same size as its fellow in your hand. When the correct distance is found, a mark on the base of the camera will save your time on the next occasion. Now fix the camera to the tilting table and the tripod, and by means of the tilting table point the lens down towards the floor. The diaphragm of the lens should be equidistant between the drawing board and the camera screen, or in practice a shade further from the drawing board and the object. Level the camera screen with the help of a spirit level. Now raise the drawing board by putting papers

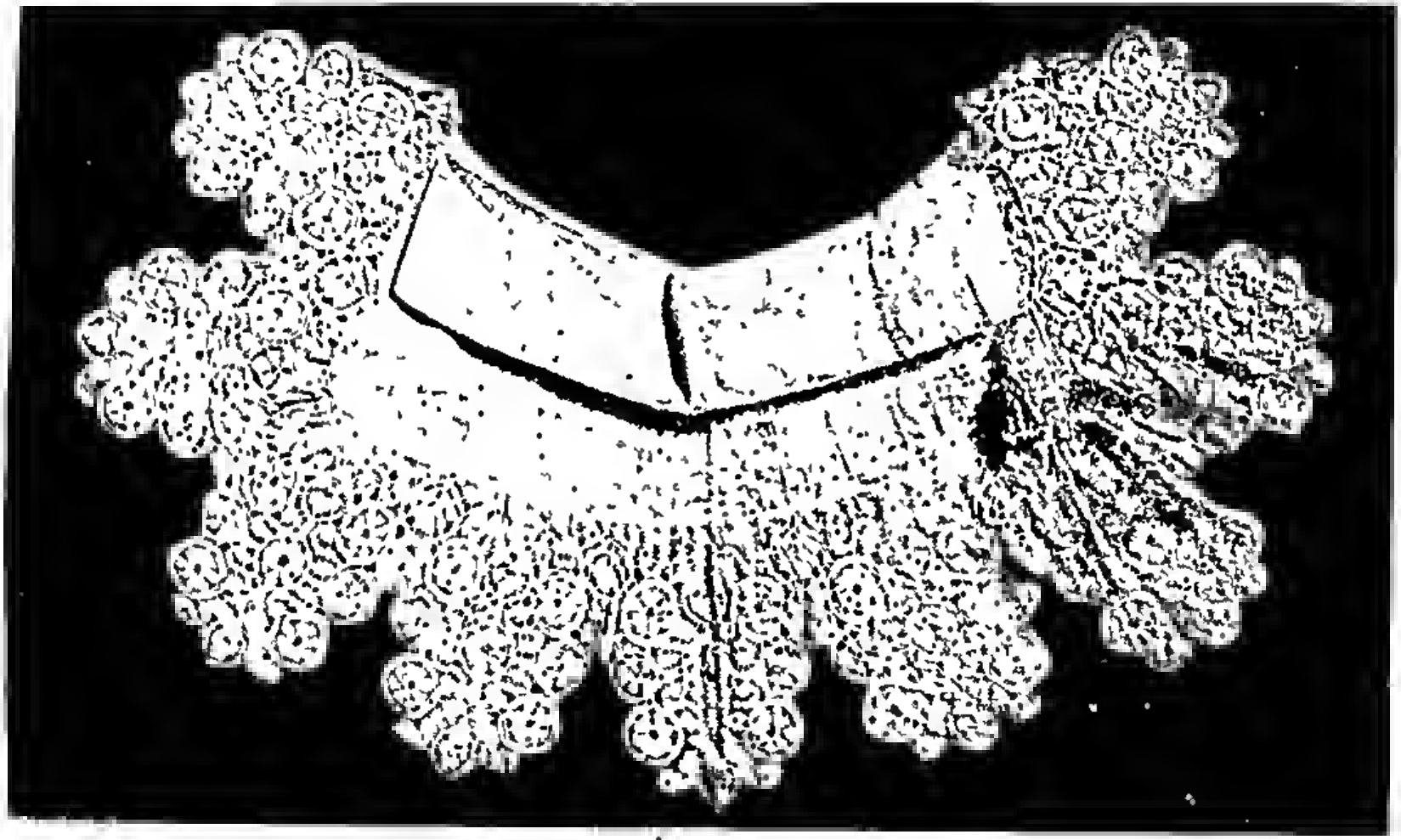


Fig 1

Flemish Collar (Early Seventeenth Century) An illustration from "Pillow Lace"

By kind permission of John Murray

or books underneath until the image of the lace on the screen is sharp. It will then be natural size. The board with the lace upon it is carefully levelled also, and then comes the question of exposure.

Backed plates should be employed, and in some cases they should be

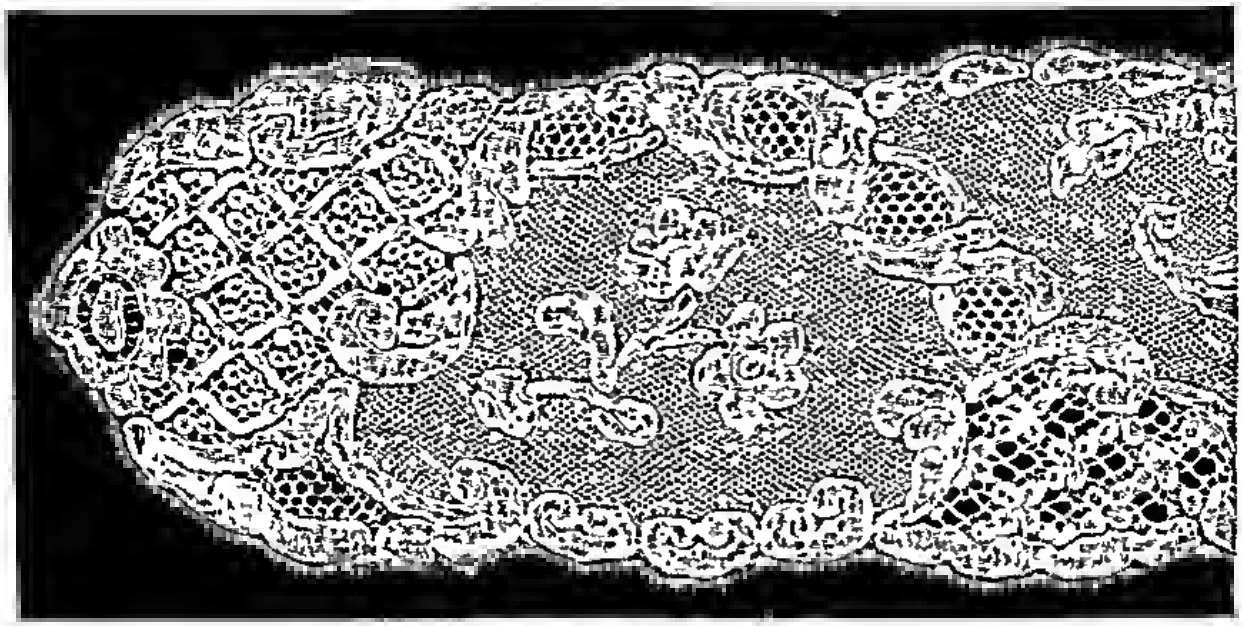


Fig 2 Mechlin Lappet (Early Eighteenth Century)

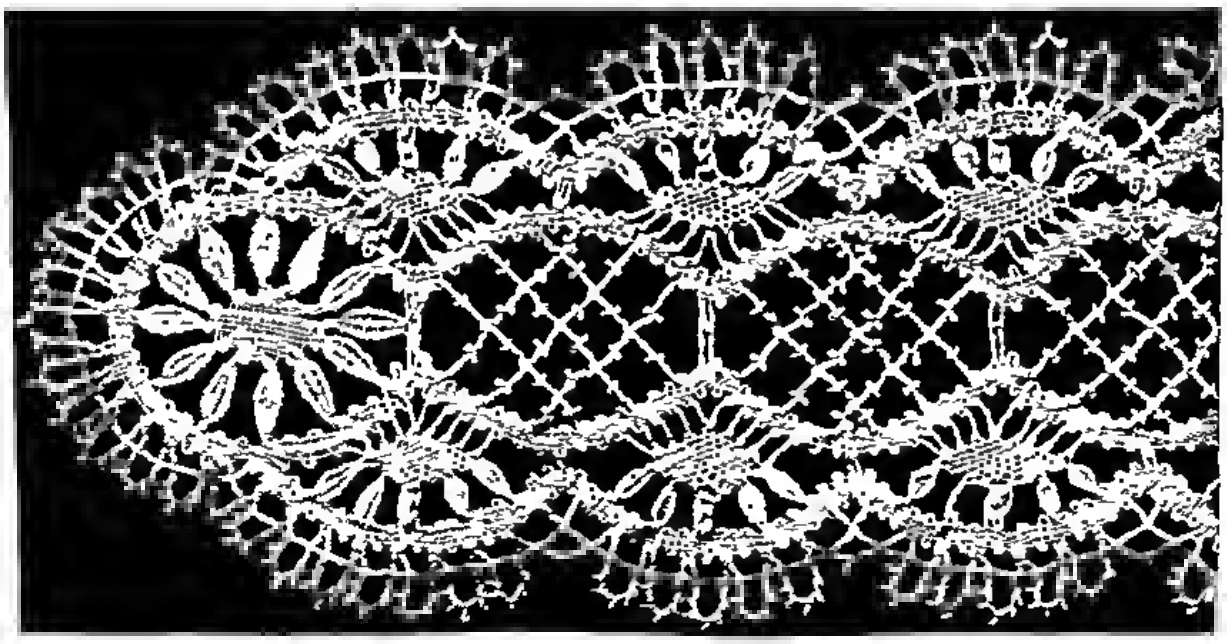


Fig 3 Maltese Tie (Modern)

By kind permission of John Murray.

isochromatic also. I used ordinary plates in all cases, and did not find that the yellowing effect of age upon old laces required any special treatment. The exposure upon slow plates, scale natural size, lens at //11, was ¼ of the time that

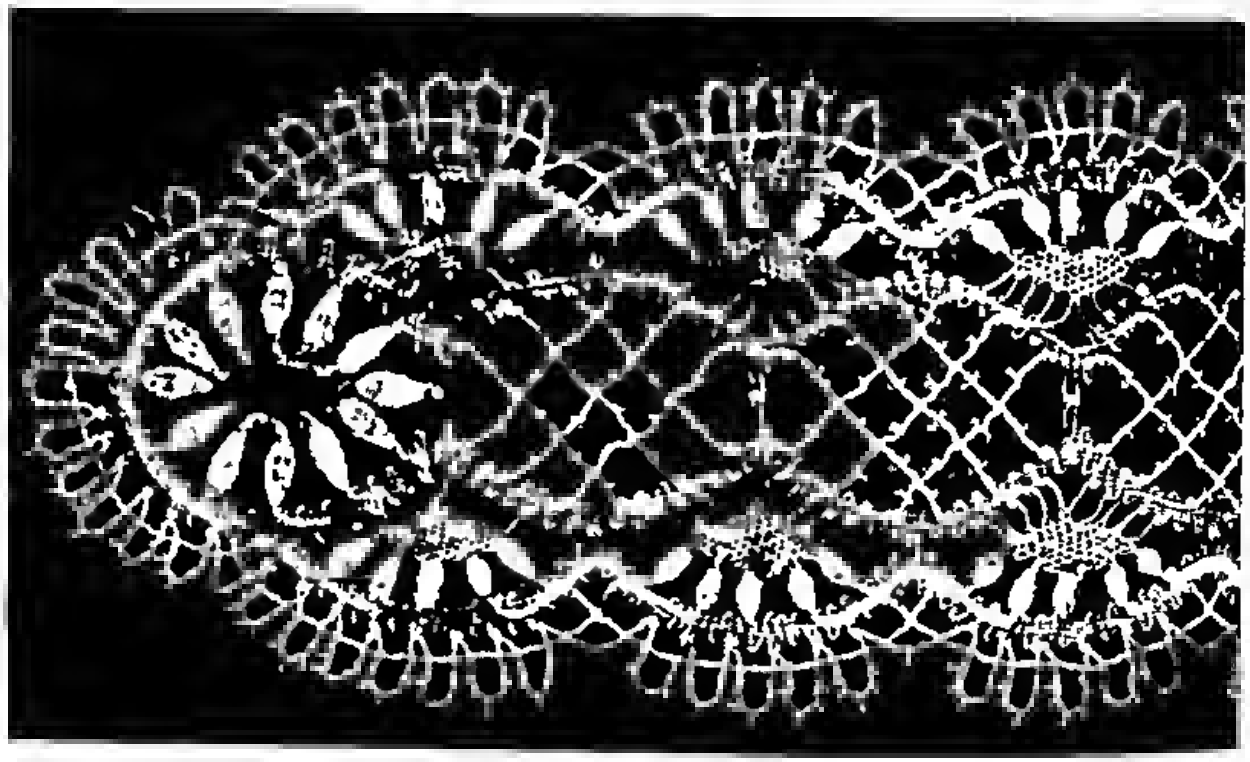


Fig 4 Maltese Tie Contact print from the lace itself

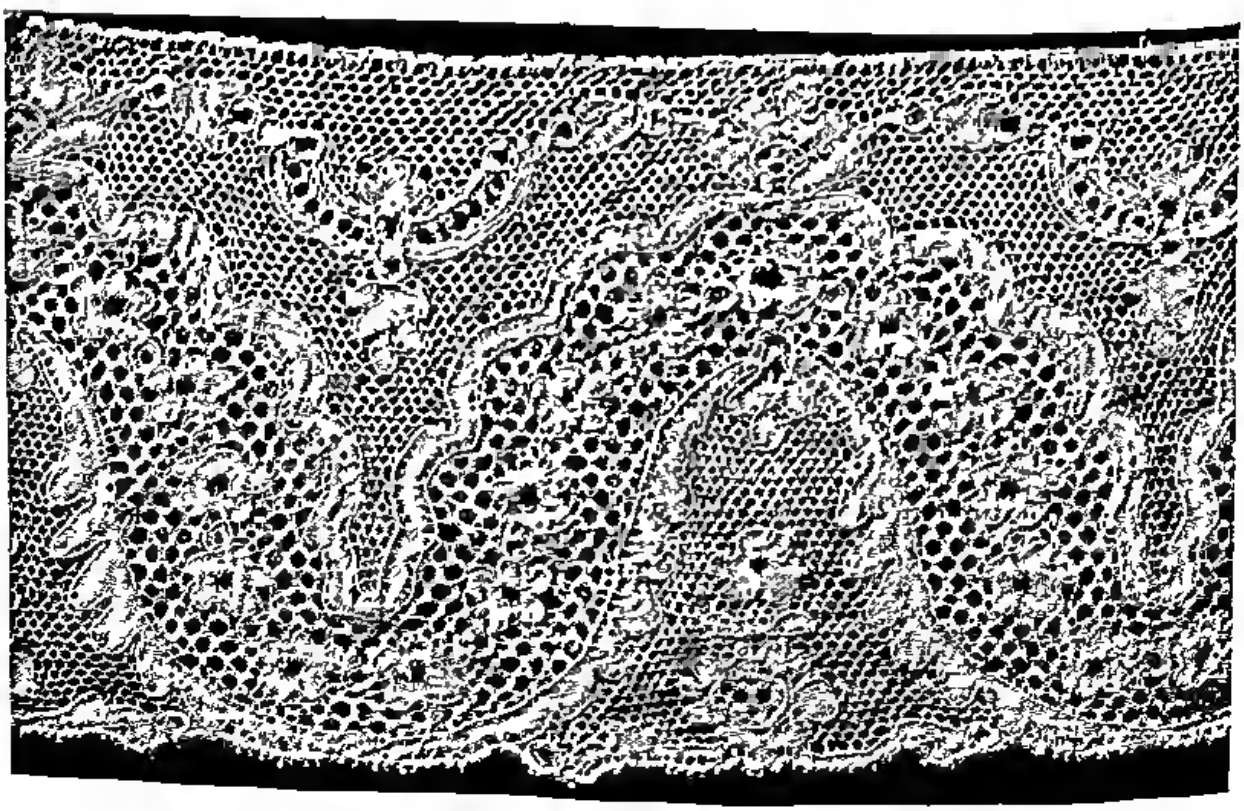


Fig 5 "Buckingham" Lace Made in India (Modern)

the sensitometer (Stanley's) took to reach the standard tint. The sensitometer time in October ran from 4 to 6 minutes during the middle of the day and exposures varied from 1 to 1½ minutes; one lace described as "yellow" in my notebook had 3 minutes' exposure. The Mechlin lappet, reproduced in Fig. 2, received 1¼ minutes' exposure.

The aim in most cases was to get an even lighting of the object, and for this the floor position is the best. There are exceptions, of course, to this rule, and the little lace collar serves my point again. A side lighting tended to make a more effective illustration, so the screen with the collar attached was arranged vertically and the camera set to correspond. As the camera extension was reduced, the exposure was cut down to 45 seconds.

Development of the plates should be done by time, as it is difficult, perhaps impossible, to judge the density of the negative by appearances, particularly where the threads are very fine, as, for example, in the case of the Mechlin lappet. Even the Maltese lace (Fig. 3), made with much coarser thread, presents some difficulty; it is so easy to get the high-light details blocked, and then, instead of seeing the run of the threads, there is nothing but a white mass against the black background. Trials made at home on some coarse lace showed that five minutes' development with the following developer gave the class of negative required, and the same treatment was meted out to the negatives of finer laces with equal success.

1.	2.	3
Pyro ..... 1 oz.	Soda carb. .. 1 oz.	Bromide of potash . 1 oz.
Potass. metabisulphite..... 1 dram.	,, sulphite 1 oz.	Water to ..... 10 oz.
Water to ..... 10 oz.	Water to.... 10 oz.	

Developer 60 mins. No. 1, 1½ oz. No. 2, 30 mins No. 3, made up to 3 ounces with water.

The time of development would naturally vary with different makes of plates and temperatures. Five minutes will generally suffice.

For printing, first this was done on P.O.P., but ultimately I took to a glossy bromide (S.C.P.), which was less trouble to work and gave a good black background with detail in the high-lights.

There is another method of obtaining records of lace which are quite as adequate as photographs for guides and patterns to those skilled in the art of lacemaking. On a piece of clean glass in a printing frame lay the lace to be copied, and on top of that place a sheet of the bromide paper mentioned above, close up the frame and expose by means of magnesium ribbon One inch of ribbon at the distance of two feet is sufficient for a lace of average thickness. Compare the result obtained in this way, Fig. 4, with the photograph of the actual piece of *Maltese lace* on page 164. Patterns of more complicated structure with raised work upon them could not, of course, be treated so successfully in this way.

THE RATIOMETER LENS.

(Patent)

By HOWARD FARMER,

Polytechnic School of Photography and Photo-Engraving

SUPPOSE a cabinet maker, having to supply a certain article in various sizes, cuts and shapes the various pieces of wood, which together form the article, by approximate guess work; cutting pieces off afterwards if they are found too large or sticking pieces on if found too small

Except at the loss of waste time and material such a worker's productions would vary much in quality, and he could not compete either in cost of production or uniformity of good workmanship with a competitor using suitable gauges and scale measurements.

This example of cabinet work is exactly comparable with that of screen negative making, and it is owing to the lack of provision of comparative quantitative adjustments that the screen operator has been compelled to give a bit more exposure, or a bit more intensification, to get his dots large enough, or to cut a bit off his exposure or a bit more with his reducers to get his dots small enough, with an inevitable loss of uniformity and quality.

Type A. For Photo-Engravers' Work.

The ratiometer lens is designed to rectify the deficiency and provide the operator with the necessary gauges and measurements for adjusting his stops to the various copies, screen distances and camera extensions with which he has to deal.

There is at the same time absolutely no interference with his skill in manipulation, or loss of personality in his work, either in the number or size of the stops he uses, or in the desirable characters of his negatives; but every operator knows that to obtain his particular results, certain exposures and stops are necessary, and that these only apply to one scale of reproduction: he is also conscious that if he had means to readily alter the sizes of his stops in the same ratios as the camera extensions, he could secure uniformity in his negatives.

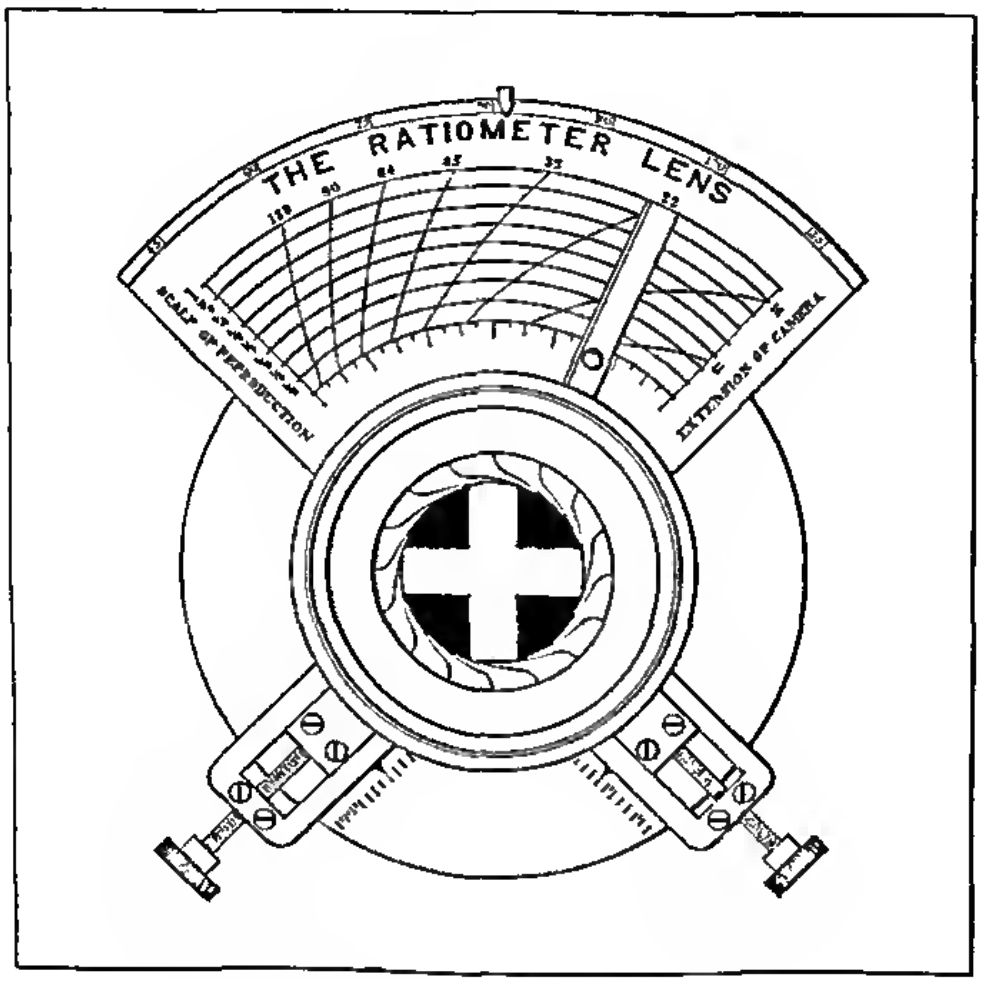
These adjustments are mechanically and instantly secured with the Ratiometer Lens either with round, square or similar stops.

More than this: Screen negatives can be taken with circular diaphragms or with square or similar diaphragms, and these are efficient when the aim of the operator is confined to securing the high-lights and shadow dots correctly, the intermediate gradations looking after themselves; they are also efficient when the copy is specially adapted to them.

But when it is desired to secure the finest results with the intermediate gradations or to modify them, or to modify the procedure to suit different types of copy, it has been shown that the gradations of the individual dot should bear a direct relation to that of the copy or the operator's requirements, and that therefore a suitable alteration in the distribution and values of the light passing through the screen openings from a given cone section of light is the determining factor in success.

The utilization of this factor has hitherto not been practicable, owing to the

lack of means of varying the lens apertures when of suitable character, in harmony with the variable camera extensions. This difficulty is also overcome with the ratiometer lens which gives apertures having widely different gradation values,



which are also mechanically and instantly adjustable to the required shape and ratio to suit the different copies and camera extensions.

As will be seen from the illustration the instrument consists of a suitable lens, which in addition to its iris diaphragm is provided with four movable

perforated plates which are symmetrically adjustable around the optical axis by means of two screws at right angles to each other, the screws being provided with scales and indicators by which the position of the plates they move is indicated The iris diaphragm is adjusted in position by a lever indicator passing over a diagram engraved on a plate affixed above the lens—the diagram indicating not only the usual F ratios but also the working ratios for different scales of reproduction, as well as the actual size of the aperture in any position—this latter information being for the purpose of adjusting the diaphragm plates, also to the ratios of the camera extensions

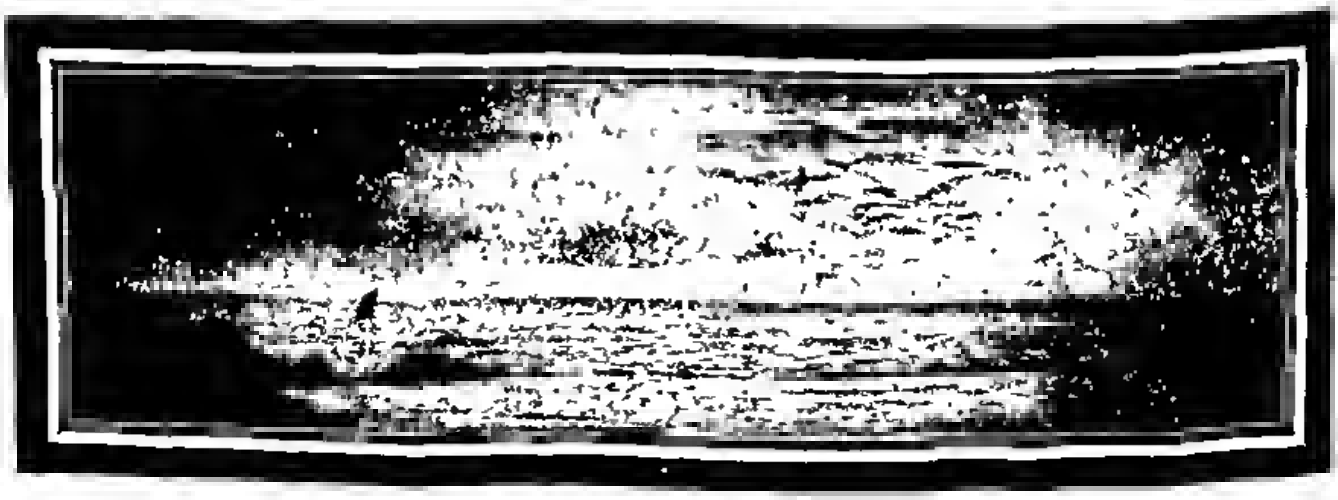
The diaphragms of any shape are also adjustable to the various angles required in colour work and the whole of the mechanism being attached to the lens without loose parts is conveniently operated by two screws and two levers projecting from it.

Type B. With Iris Diaphragm only. For Copying, Enlarging, etc.

Every worker now-a-days recognises the importance of correct exposures, and therefore also the usefulness of the ratio system of marking lens diaphragms, no better evidence being required than its universal adoption where practicable, that is, when the camera images are very small compared with the original.

In copying, enlarging, and all work where the image is not greatly reduced, or is larger than the original, there are wide variations in the extension of the camera, and the ratios as hitherto marked become incorrect and ridiculous and indicate neither the exposures nor their relation to one another.

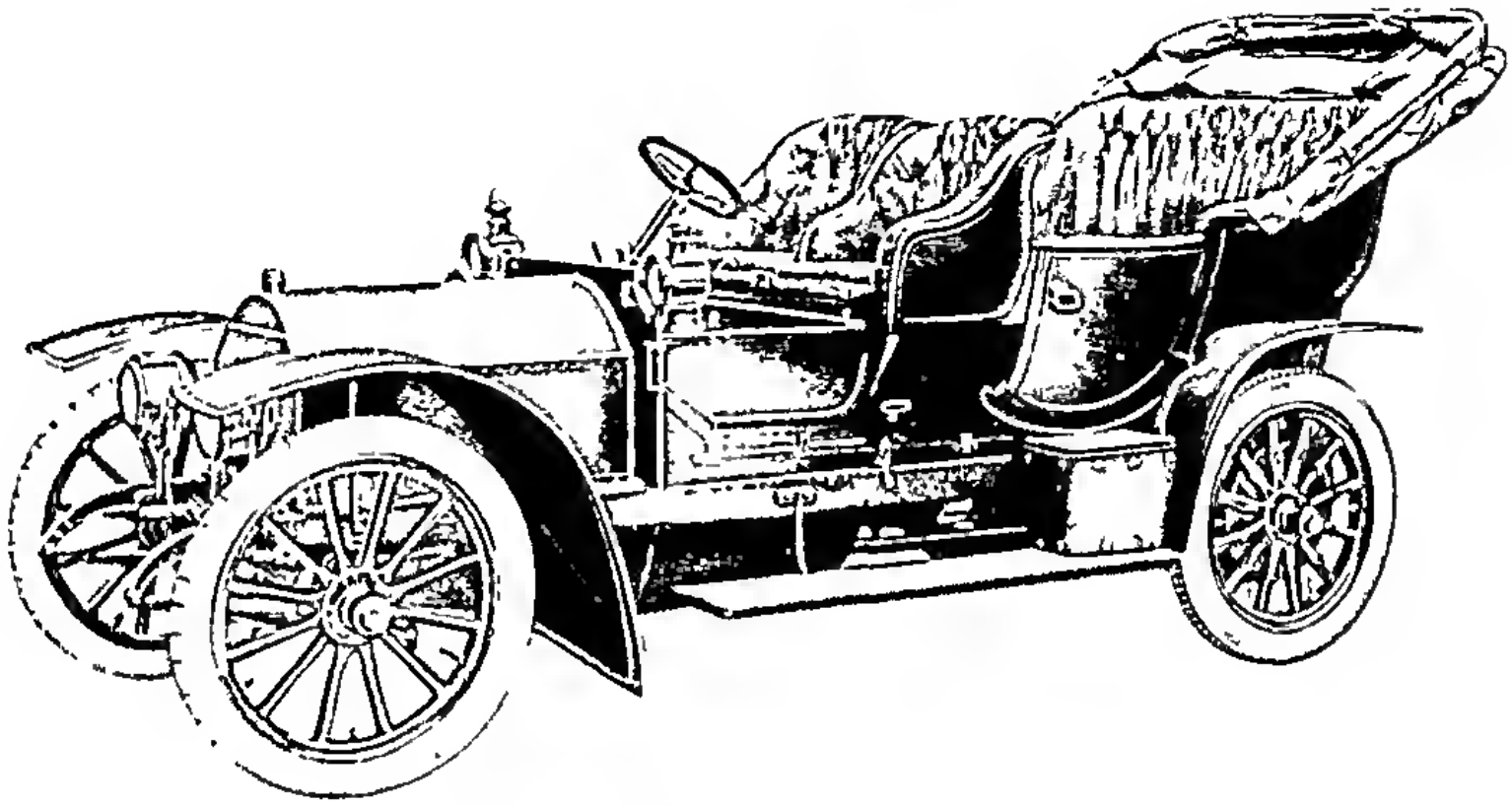
The Ratiometer lens, with the plain iris and engraved diagram gives the ratios, and therefore also the exposure values, under all these conditions, so that the worker can either retain his exposures constant, or at once knows the relative exposures with different stops and conjugate foci.



SHADES OF EVENTIDE (Isle of Man)

Block by
GILCHRIST BROS.

Photograph by
C S BEST.



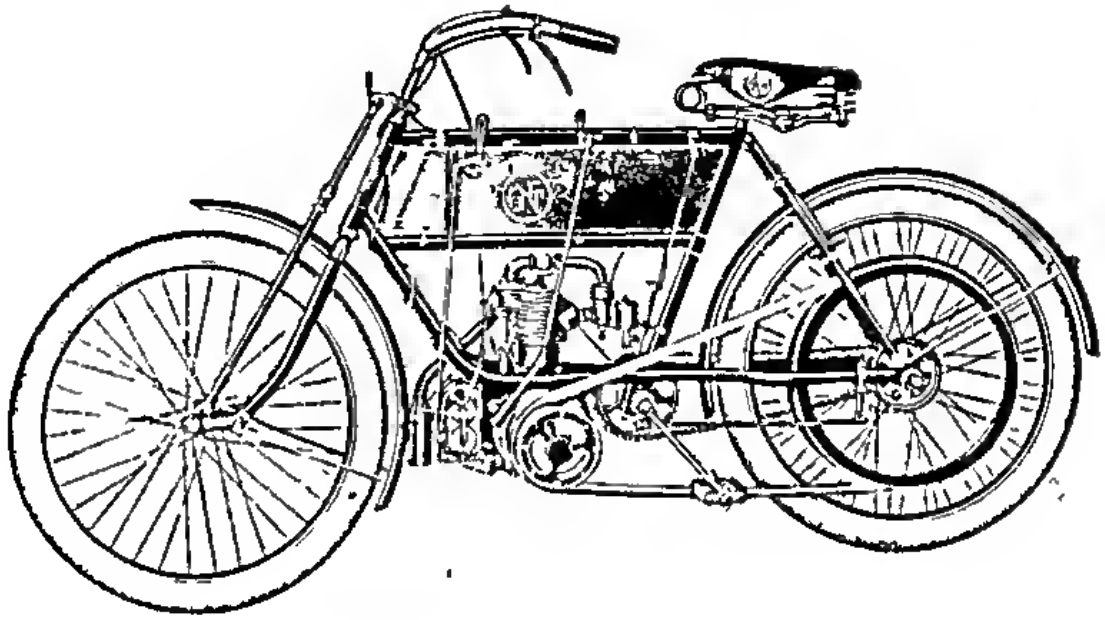
CATALOGUE ILLUSTRATION.

(By permission of Chambers Motors, Ltd.

W. & G. Baird, Ltd.

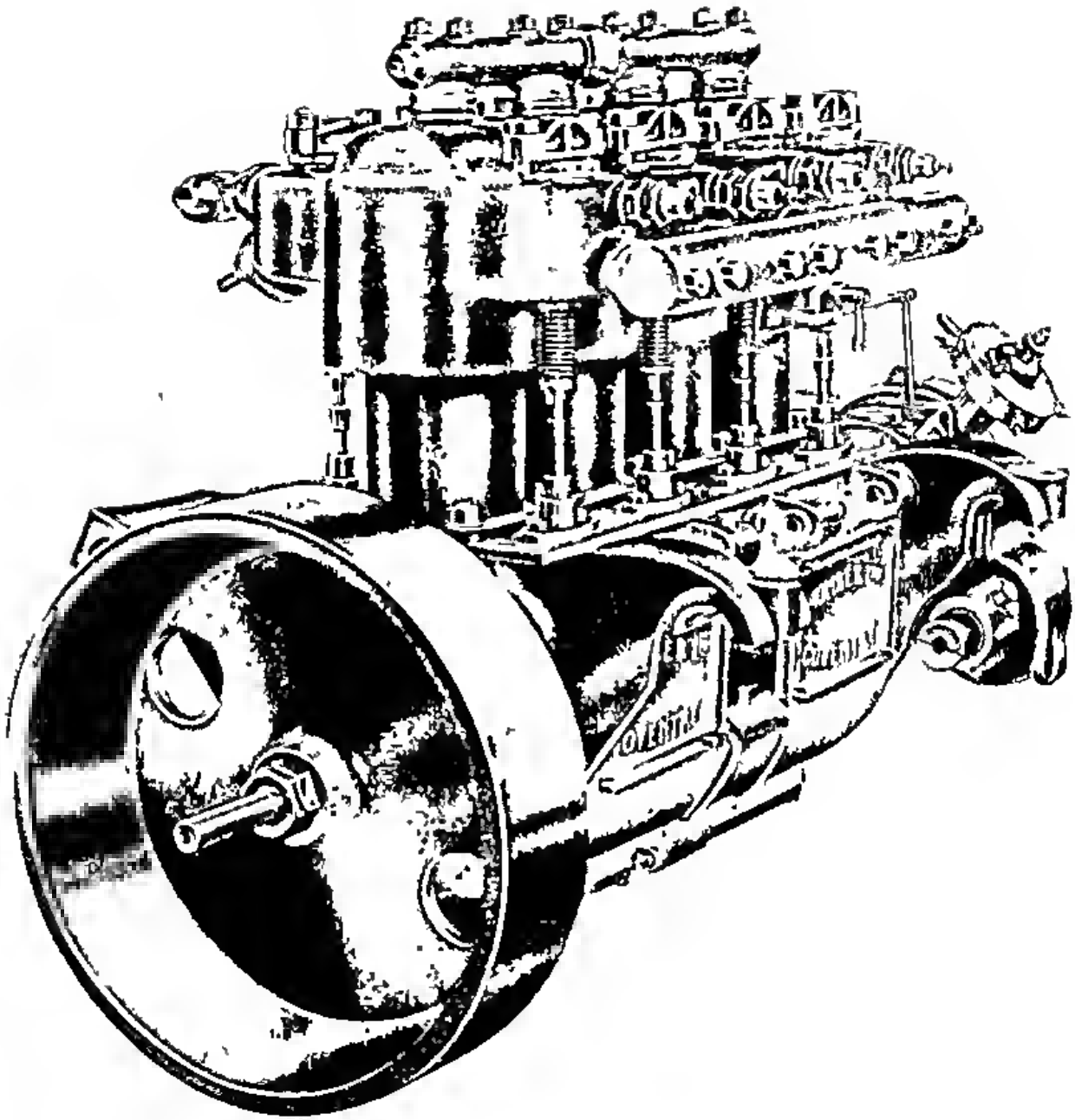
A FASHION DESIGN.

Ashworth & Meredith.

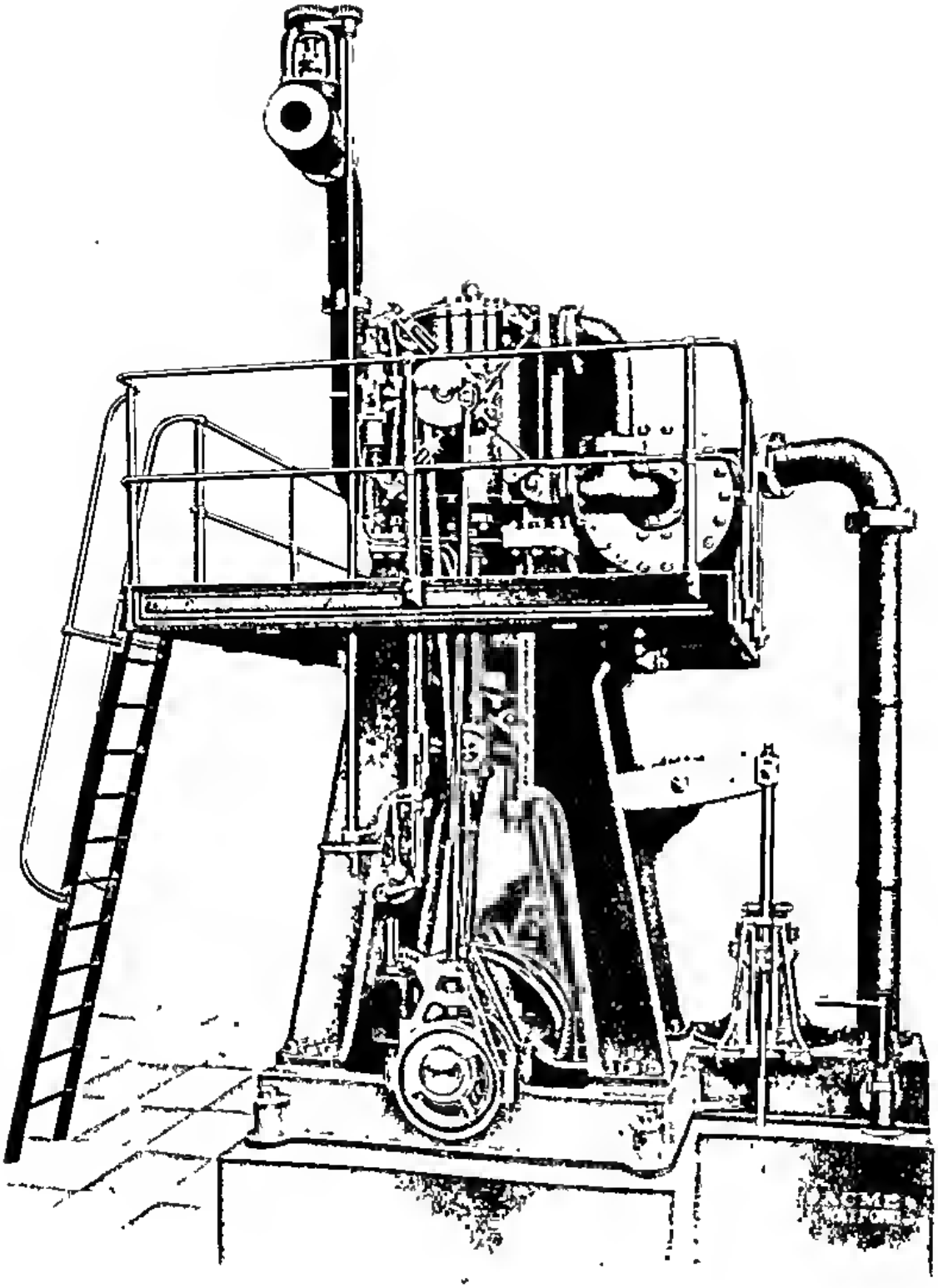


CATALOGUE ILLUSTRATION.

Ashworth & Meredith.



CATALOGUE ILLUSTRATION.



CATALOGUE ILLUSTRATION.

Acme Tone Engraving Co., Ltd.

Therefore, it is a rule to use for hard metal a blade having very fine teeth; for cross-cutting, that is, cutting across the grain of wood, a saw with teeth of medium size; while for ripping, or cutting with the grain, large, coarse teeth will give the best service.

In Fig. 2 is shown a section of a blade, *full* size, having teeth *suitable for* zinc and copper, while Fig 3 shows a characteristic tooth for ripping wood. A comparison of these two will clearly illustrate the wide difference between a blade for cutting metal and one for cutting wood In engraving establishments, however, it is sometimes necessary to effect a compromise in cases where mounted plates must be sawed. Here we have both metal and wood to be cut at the same time, and the only way out of the difficulty is to use a blade between the two extremes A blade such as is *shown in Fig 1* can be used successfully for this work, if kept in proper orde .

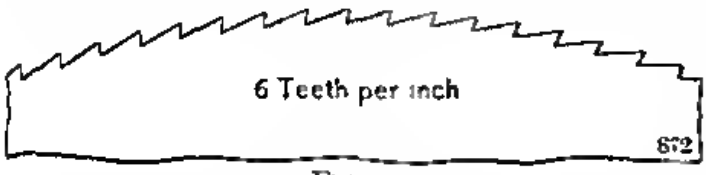


Fig 2

The diameter of the blade is a matter too important to be overlooked. The greater the diameter the more cutting points, but if the diameter be excessive, the blade may lack rigidity, and must be made of heavy gauge to overcome this. As a general rule, the smaller the blade the better, but of course it is necessary to use a blade with sufficient projection above the table to extend through the work. For this reason, the saw-table has to be taken into account when selecting blades A saw in which *the distance from the centre* of the mandrel to the surface of the table is short, is to be preferred, as it greatly simplifies the selection and use of blades. In sawing, the table should be raised so that the blade just extends through the work. Excessive projection above the surface of the work is useless and dangerous.

The right blade having been selected, it remains to keep it in proper order, as unless this is done all the skill in the world will not enable you to get good results.

There are three things of prime importance in the care of saw blades:

1st. The blade must be round and true, with teeth of even length, so that every tooth cuts

2nd. Every tooth must be sharp.

3rd Every tooth must have proper set.

To keep a blade round and the teeth of even height is a very simple matter if *rightly gone about and not neglected too long.* If the blade is *in very* bad order, with some of the teeth greatly worn down and others projecting considerably beyond the line, repeated operations may be necessary to put it in perfect shape Here is a simple, easy and effective way, equally applicable to all conditions of the blade:

Start the saw, and when it is running at full speed, push a small piece of emery (part of a broken wheel will do) against the teeth, touching them very lightly, and moving the piece of emery to and fro across the face of the teeth sideways. This will grind down the high teeth straight across and prevent rounding of the face Stop the saw occasionally and examine the teeth to see how the work is progressing. If the blade is in very bad order, you will *soon find that the grinding tends to destroy* the shape of certain teeth. Before this takes place, cease operations, file the saw carefully

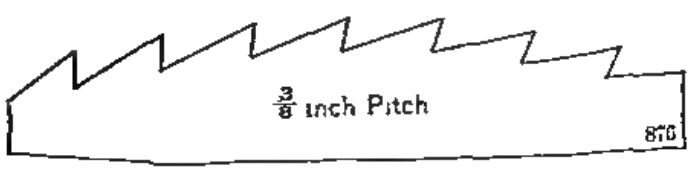


Fig 3

and put it in service. As soon as it gets the least dull, repeat the operation, and in a short time you will reduce the teeth to an even height, and by a little care you will be able to keep them so.

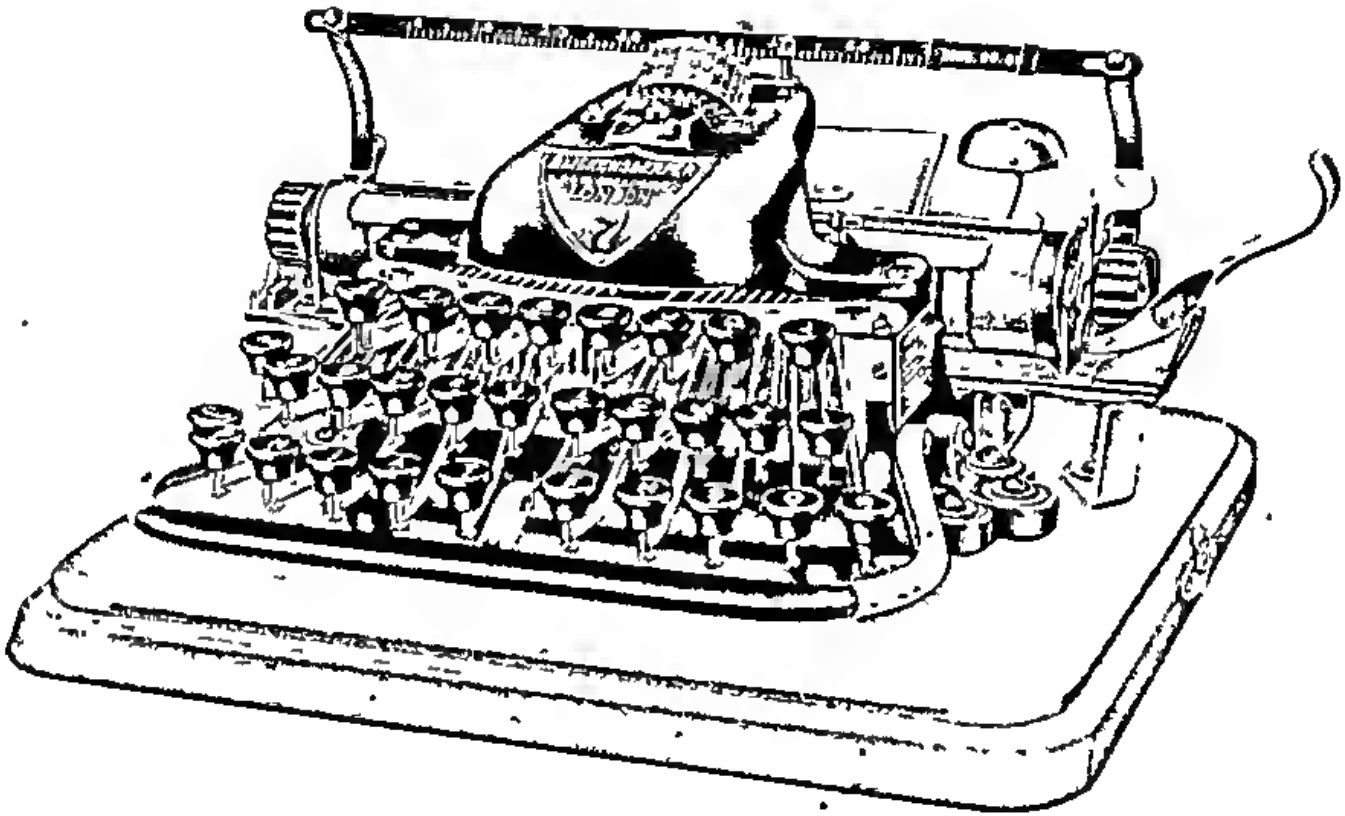
It is best to do this frequently, as most troubles in grinding arise from neglecting the work too long. If there are no very long teeth, simply a general unevenness, the spark can sometimes be used as a guide. When this shows evenly around the periphery, it is an indication that the teeth are all of even height. This is not a safe guide to rely upon, however, if the blade is badly worn, as in such cases it may be impossible to restore the entire blade without risk of destroying the correct form of the teeth. It is perhaps unnecessary to point out the desirability of looking out for your fingers when performing this operation. If your hand is not steady, use a small clamp for holding the piece of emery.

The blade should now be removed to the clamps for filing, an operation in which an ounce of practice is worth a pound of theory. The following general rules, however, should always be observed:

File the front of the tooth first, then file the back, taking care to remove the chip thrown up by the file from the front. Use a sharp file and make a smooth, clean cut. Take off sufficient metal to make the tooth sharp, but be careful to avoid cutting down the tooth. Another thing; it is always well to have a blade filed by the same man each time. There is as much individuality in saw filing as in handwriting, and it is a mistake to mix styles. Better yet, make one man responsible for all the saws in the shop, and see that he has time to attend to them.

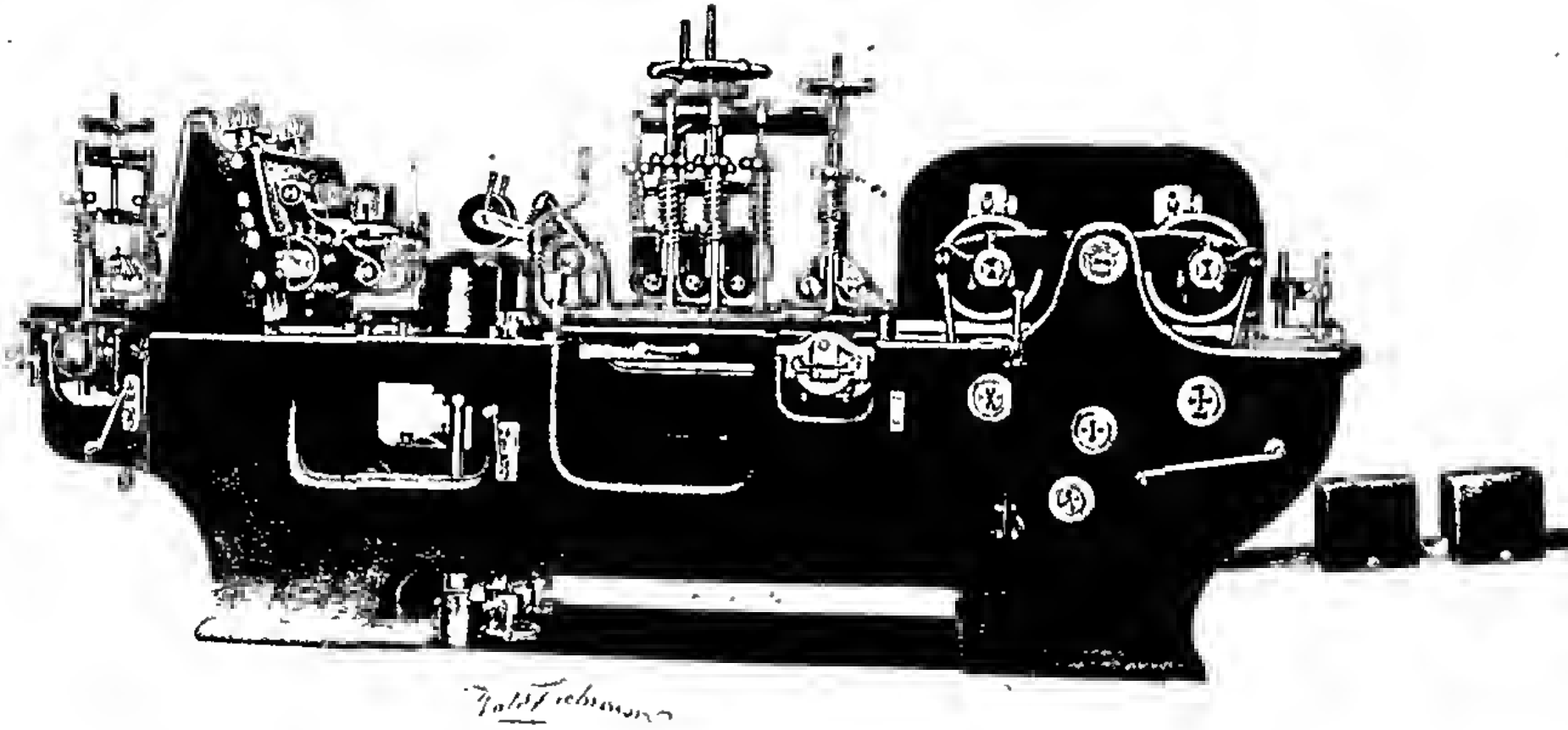
Next comes the operation of setting. In order to have proper clearance, the point of each tooth must be bent over slightly, alternately right and left. This operation requires some care. The point only must be set over, and too much set must be avoided. Never use a nail or punch for this work. A saw-set and a light hammer are the proper tools, and the man who uses them should be trained to strike a perfectly uniform blow. But one blow should be struck on each tooth, and this should be so regulated as to give enough set without need for a repetition. Too much set means waste and rough cutting. If you attempt to run the saw without enough set it will bind, buckle and burn; in a word, you will ruin the blade. When the saw sticks and screeches and the wood becomes scorched, it is generally an indication that the saw is dull and the set is out of the teeth. Attend to it at once or you may need a new blade.

Some engravers appear to think they can save time by neglecting the saw. This is an expensive error. Quick, clean work can only be done with the right blade, in proper order, and on the right machine. With a saw in the pink of condition, it is quite possible to square and finish blocks so that subsequent trimming on shoot board or edger is unnecessary. This may sound surprising to some, but it is true nevertheless. Try the experiment of getting and using the right saws. Put a competent man in charge, let him keep the blades in first-class condition, and see what a difference it will make in the convenience and operating cost of the blocking department.



CATALOGUE ILLUSTRATION.

(By kind permission of The Hlickensdafer Co.)



SWEDISH WOODWORKING MACHINE.

Wald. Zachrisson.

THREE-COLOUR PROCESS BLOCKS

From Drawing.

B. Dellagana & Co., Ltd.

ELECTROS

From Half-tone Blocks.

TRICHROMATIC EFFECTS IN TWO PRINTINGS.

By ILSTON COX.

IT will be of some interest to artists, engravers and others to know that a development in two-colour printing has recently been perfected, by which it is possible to produce illustrations having the appearance of three-colour printing by the super-position of only two colours.

To attain this end special shades of red and blue ink have been prepared by the firm of Shackell, Edwards and Co., Ltd., and at their instance a paper almost exactly matching the most approved shade of trichromatic yellow bas, after considerable experiment, been manufactured by Messrs. John Dickinson & Co.

These are briefly the principal factors in the process, as it is only necessary to utilize the red and blue blocks of a suitable three-colour set to exhibit the possibilities of this method of printing.

The object of adopting the lemon-coated paper is obviously one of economy, as by its means a saving of nearly one-third of the expense of three-colour printing may be effected.

The suggestion that the blocks must be suitable infers limitations, and so it must be clearly stated that the majority of existing subjects would not do justice to this method

It is necessary that pale yellow should take the place of white in the high-lights, and that pink tints and light blues should be replaced by darker colours.

In spite of these disadvantages, however, it is quite possible to have a harmony of colour in such a picture, and the yellow tones may be made to appear paler by judicious contrasts with other colours.

This feature is well brought out in a cleverly executed Japanese subject, showing a figure illuminated by

PORT ERIN.

Block by GILCHRIST BROS

Chinese lanterns, which has been commercially used on the lid of a cardboard box.

A pictorial post-card and a paper book cover, illustrating a Red Indian and a landscape sunset respectively, have also been issued by the ink makers, showing the value of contrast in reducing the strength of the yellow foundation

The uses to which a yellow paper or board can be put are necessarily limited, but apart from the articles referred to, there is a large field open for the introduction of the "Yellow Art," and among other purposes may be mentioned the covers of magazines, novels and catalogues, labels and circulars, greeting and playing cards, wrappers and programmes, show-cards and calendars

Without a doubt the drawbacks to the use of the yellow paper are least evident in an artificial light, and so one's thoughts naturally travel to the many tubes and underground railways now existing in London, where numerous spaces await the artistic advertiser.

Here, therefore, the designer should find a particularly good opening for displaying his skill, whereby the "man in the street" (or tube) would be unable to distinguish an "imitation" three-colour print from the genuine impression.

In supplying blocks for this form of two-colour printing it will not, of course, be necessary to use the violet filter at all, the yellow plate being dispensed with altogether, and as the screens for the red and blue blocks will be ruled to cross at 45° as usual, there need be no variation in the ordinary procedure of block making.

If, however, it is thought that in the absence of a yellow block the red should not print at an angle of 15° with the sides of the picture, it could be arranged for the lines to run vertically and horizontally, and thus equally bisect the impression from the blue plate, which it is assumed prints at 45° with the perpendicular.

Already the attention of a number of advertisers and three-colour printers has been arrested by the process under review, and the onus, therefore, falls on the man of "colour" to exhibit what his brush can produce on a gamboge-tinted plane.

In other words, it is merely a question of enterprise on the part of the artist and printer to show that there really is an economic value attaching to the production of illustration on a yellow-coloured ground.

THE TOWER BRIDGE.

Engraved by
THE ARC ENGRAVING CO., LTD

Photograph by
ALF J. THORNE

LINE-ETCHING DEPTHS.

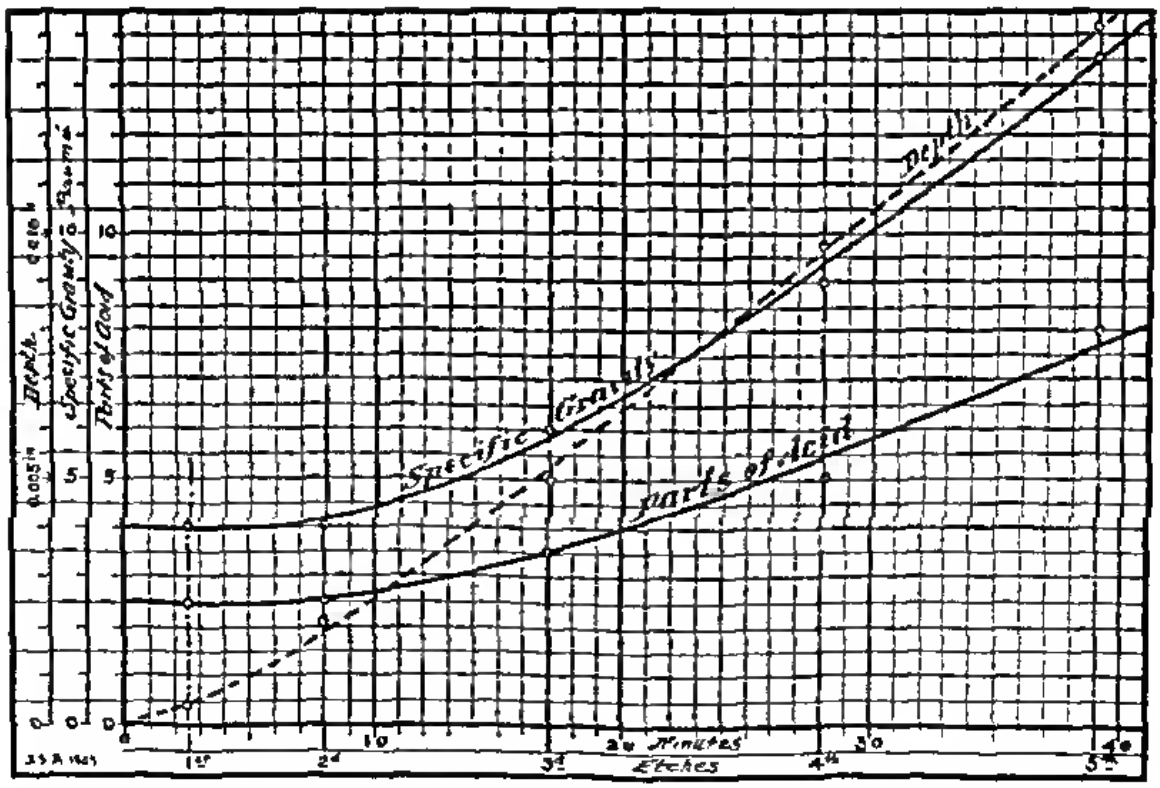
By N. S. AMSTUTZ,

Principal, Inland Printer Research Department.

IN order to determine what the practical results of etching on zinc under different acid strengths and various times in the acid are, a series of tests have been made, and Table No. 12 compiled therefrom shows what the acid strengths were, the minutes in the bath, specific gravity, temperature, and actual depth of etching.

The first bite was given 2½ minutes with 2½ parts of commercial nitric acid to 32 parts water; the second received 5½ minutes additional, in the same strength of acid; the third, 9 minutes, with the same acid increased so as to have 3⅝ parts to 32 parts of water; and the fourth bite received 11 minutes in addition, with the acid strengthened up to 5 parts to 32 of water. An alternative fourth bite (5) is listed, in which the time added was the same as the previous etch, but the acid was increased to 8 parts in 32 of water.

This table is valuable because of the practical data it contains and the definite depths that are disclosed under the different conditions.



The accompanying figure showing three graphic curves illustrates the relative value of time in minutes, etches, parts of acid, specific gravities and depths, these, in connection with the table, establish a record of actual conditions from which the etcher may draw his own conclusions in practical work.

Chinese lanterns, which has been commercially used on the lid of a cardboard

A pictorial post-card and a paper book cover, illustrating a Red India a landscape sunset respectively, have also been issued by the ink makers, sh the value of contrast in reducing the strength of the yellow foundation.

The uses to which a yellow paper or board can be put are necessarily li but apart from the articles referred to, there is a large field open for the introd of the "Yellow Art," and among other purposes may be mentioned the of magazines, novels and catalogues, labels and circulars, greeting and p cards, wrappers and programmes, show-cards and calendars.

Without a doubt the drawbacks to the use of the yellow paper are evident in an artificial light, and so one's thoughts naturally travel to the tubes and underground railways now existing in London, where numerous s await the artistic advertiser.

Here, therefore, the designer should find a particularly good openi displaying his skill, whereby the "man in the street" (or tube) would be u to distinguish an "imitation" three-colour print from the genuine impressi

In supplying blocks for this form of two-colour printing it will not, of c be necessary to use the violet filter at all, the yellow plate being dispensed altogether, and as the screens for the red and blue blocks will be ruled to at 45° as usual, there need be no variation in the ordinary procedure of making.

If, however, it is thought that in the absence of a yellow block the red s not print at an angle of 15° with the sides of the picture, it could be arrang the lines to run vertically and horizontally, and thus equally bisect the impr from the blue plate, which it is assumed prints at 45° with the perpendicular

Already the attention of a number of advertisers and three-colour pri has been arrested by the process under review, and the onus, therefore, fa the man of "colour" to exhibit what his brush can produce on a gamboge-t plane.

In other words, it is merely a question of enterprise on the part of the and printer to show that there really is an economic value attaching t production of illustration on a yellow-coloured ground.

THE TOWER BRIDGE.

Engraved by
THE ARC ENGRAVING CO., LTD.

Photograph by
ALF. J. THORNE

LINE-ETCHING DEPTHS.

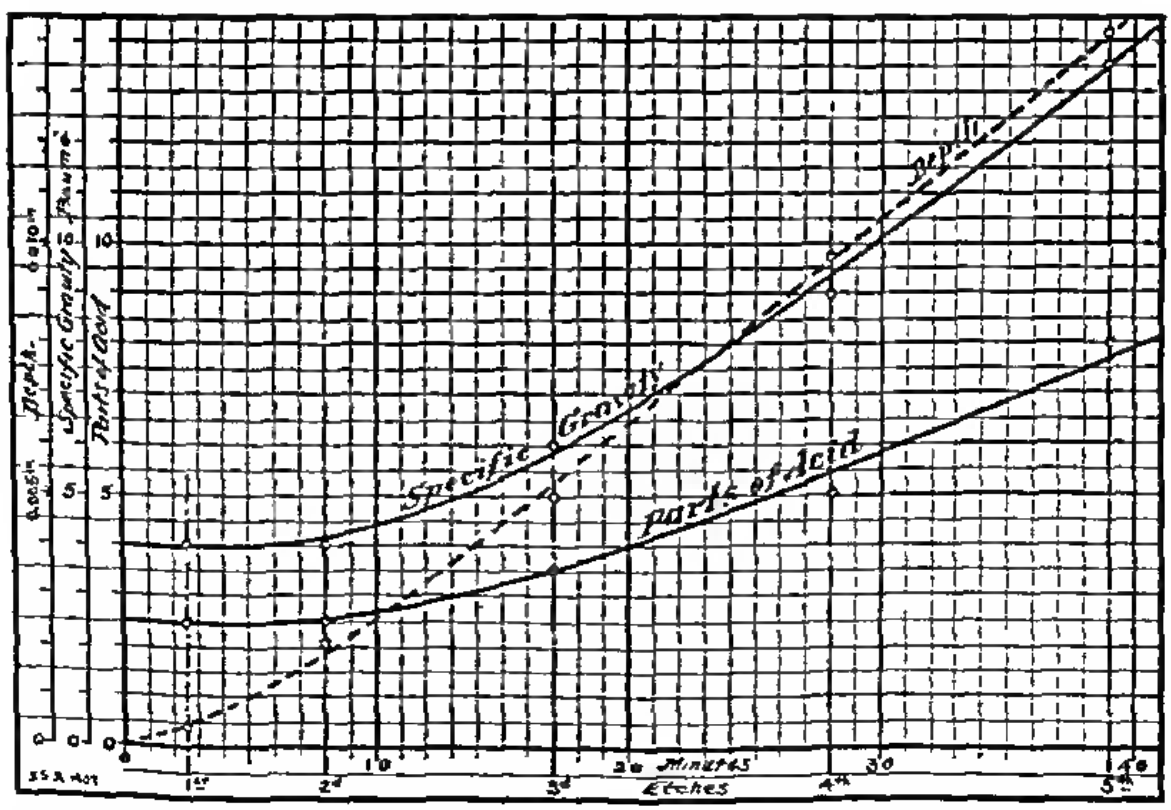
By N. S. AMSTUTZ,

Principal, Inland Printer Research Department

IN order to determine what the practical results of etching on zinc under different acid strengths and various times in the acid are, a series of tests have been made, and Table No. 12 compiled therefrom shows what the acid strengths were, the minutes in the bath, specific gravity, temperature, and actual depth of etching.

The first bite was given 2½ minutes with 2½ parts of commercial nitric acid to 32 parts water; the second received 5½ minutes additional, in the same strength of acid; the third, 9 minutes, with the same acid increased so as to have 3½ parts to 32 parts of water; and the fourth bite received 11 minutes in addition, with the acid strengthened up to 5 parts to 32 of water. An alternative fourth bite (5) is listed, in which the time added was the same as the previous etch, but the acid was increased to 8 parts in 32 of water.

This table is valuable because of the practical data it contains and the definite depths that are disclosed under the different conditions

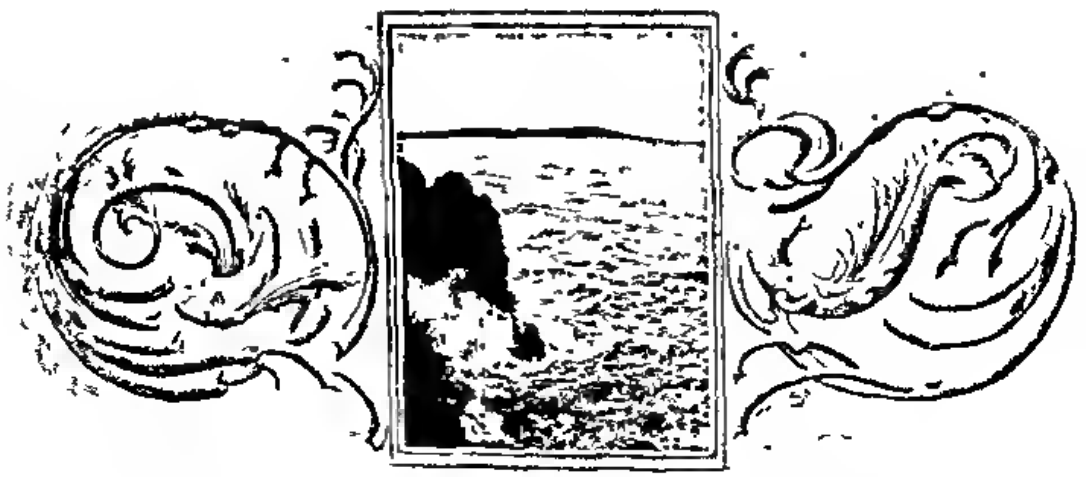


The accompanying figure showing three graphic curves illustrates the relative value of time in minutes, etches, parts of acid, specific gravities and depths, these, in connection with the table, establish a record of actual conditions from which the etcher may draw his own conclusions in practical work.

Showing depth data of zinc etching at different acid strengths and cha of time in the bath, with brushing and hand rocking, without powdering commercial nitric acid.

ETCHES	Whole time for each etch Min	Time added for each etch Min	Etching Solution			Specific gravity in ° Baumé		Depths	
			Parts of acid	Increase in parts of acid	Parts of water.	For each etch	Increase for each etch	Whole at end of each etch Inch	Incr for e etc Inc
1	2½	..	2½	..	32	4	..	0004	.
2	8	5½	2½	..	32	4	..	·0021	·00
3	17	9	3½	1	32	6	2	·0050	·00
4	28	11	5	2½	32	9	3	·0097	·00
5	39	11	8	3	32	13½	4½	·0141	·00

The average depth of machine-rocked zinc etchings ranges from about ·014 to ·016 before routing, requiring about 25 minutes for 3 stages, and 40 minutes for 4 stages. By of comparison, a 25 by 38 sheet of 70-pound coated enamel book paper is ·0035 inch th and a 25 by 38 sheet of sized and supercalendered 100-pound paper is ·005 inch thick, which it is apparent that the average depth is about equal to three thicknesses of the 100-p paper. In European practice, weaker baths are used, about 2 parts acid to 40 of water. starting temperature in each case was 80° F (about 27° C.)



ROUGH SEA AT WESTON SUPER-MARE

Engraved by
CARL HENTSCHEL, LTD

Design by
W. GILLIARD

AKROTONE TINT AT 100 LINES PER INCH, RULED VERTICALLY, IN TAN COLOUR. AUTOMATICALLY ENGRAVED FROM A CARBON PHOTOGRAPH ON THE AMSTUTZ AKROGRAPH.

150 LINE HALF-TONE, WITHOUT BORDER LINE, AND AKROTONE TINT OF ADJOINING FIGURE COMBINED

AKROGRAPHY.

From Amstutz's Handbook of Photo-Engraving

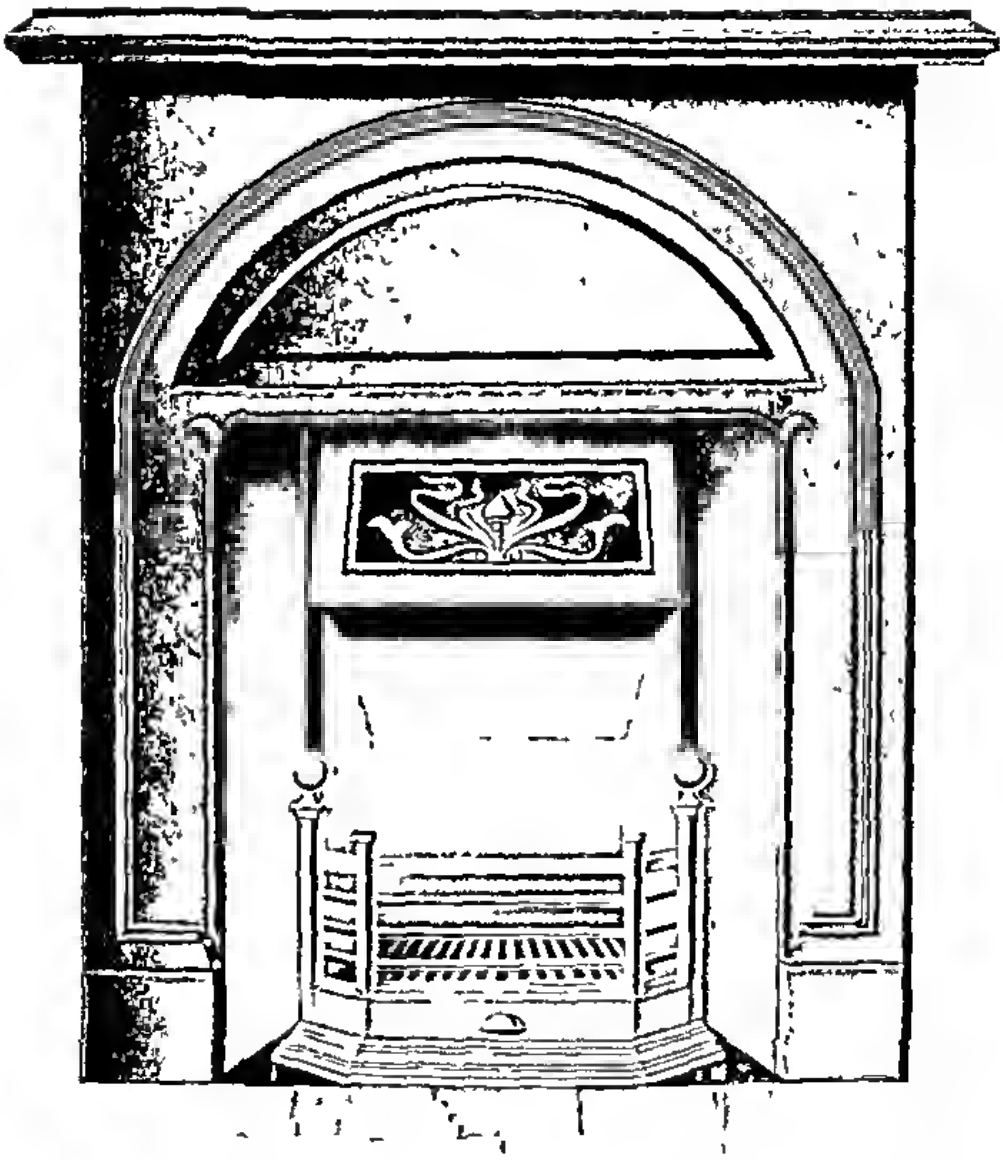


ILLUSTRATION FOR CATALOGUE.

Reliance Photo-Engraving Co.

printing; with trained workers, however, the variation in the work by the Aerograph method should be very slight.

What the writer would impress upon the attention of the practical and progressive printer is the application of the Aerograph method for its especial charm—the very soft and pleasing gradation of tints and the perfect blending of colours. It is generally conceded that this cannot be successfully initiated by any known method of printing.

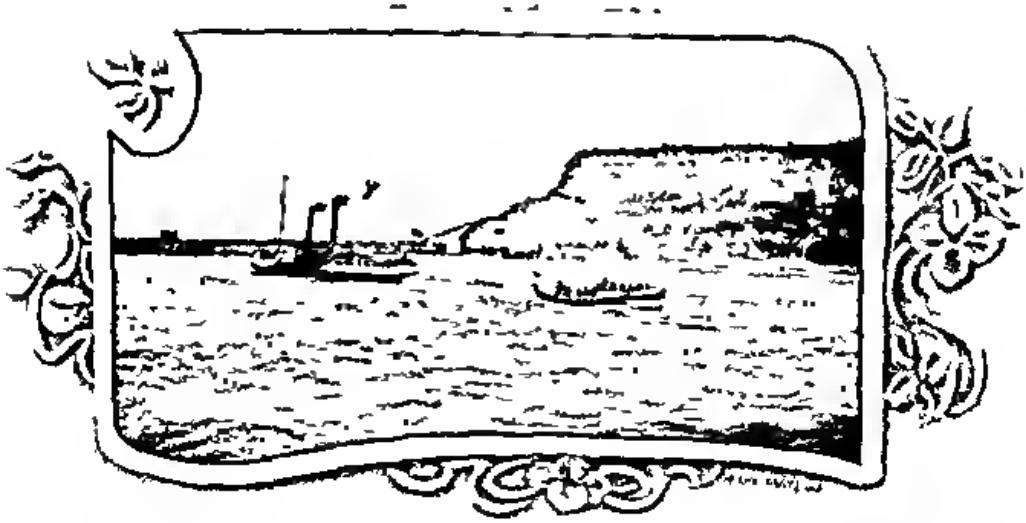
The method could he made very useful by nearly all printers in combination with ordinary printing for adding at a trifling cost a little colour to ornamental work. In small editions, the cost would be very trifling and even in large editions it would probably pay any one who is not equipped for elaborate colour production. The addition of a little colour to circular covers, menu cards, small posters, show cards and hundreds of other things would be a distinct advantage to a printer. The cost of plant is small by comparison with printing machinery, and the saving on small editions is very great.

TIPS FOR WET-PLATE WORKERS.

By ALPHONSE AUDY

LACKING a dipper, and being a few thousand miles away from Penrose's, I had to exercise my ingenuity to find a substitute, and made some beauties out of mounting wood cut the right length, and sliced in two at an angle, so that one end of each was thicker than the other. This allowed of cutting afterwards to obtain a rest for the plates, and silver rivets were put in to strengthen the same. A soaking in hot paraffin wax, or a coating of Mogul varnish to prevent the silver soaking into and rotting the wood, resulted in two dippers that stand a good deal of wear and tear.

Another tip is to have a trough filled with water for the vertical silver bath to rest in. This keeps the bath cool and in hot countries that means a lot. Sand is placed at the bottom for the bath to rest on, and prevent breakage.



Block by
WALLAGE & GILBERT.

GOING ABOARD

Design by W. GILLMAN
Photograph by A. V. KENAH

COPPER AND SILVER INTENSIFYING.

By ARCHER CLARKE.

"An' each Shepherd Woo'd his Dear"

Block by Wallace & Gilbett. Photograph by R. Braid

WET collodion operators are, I think, apt to overlook a rather important point in the manipulation of the copper and silver intensifier, and in reading the latest edition of "The Half-tone Process," by Julius Verfasser, I notice that in the otherwise very practical instructions, this point has not been sufficiently emphasized, therefore it will be useful to give you a note on the subject. This author says "wash again thoroughly after the bleaching of the image," and if this instruction is taken literally, and the plate is washed *thoroughly* it will be almost impossible to intensify it, as the copper bromide deposit is soluble, and will gradually wash away. It just requires a gentle stream of water on the end or edge of the plate to flow over, turning the plate all the time, so that it is swilled very gently from each edge for about thirty or forty seconds. The more copper sulphate one can leave on the film the better. The water is only needed to dilute the deposit of copper sulphate, so that it will take the silver nitrate solution readily. If a further application of the bleaching solution has to be given, the same rule applies, that the washing should be very slight. My experience extending over many years of wet collodion work has taught me that if a full washing of water is given as stated, the plate will be spoilt. Any operator can test the matter for himself.

CONCERNING · OPERATORS.

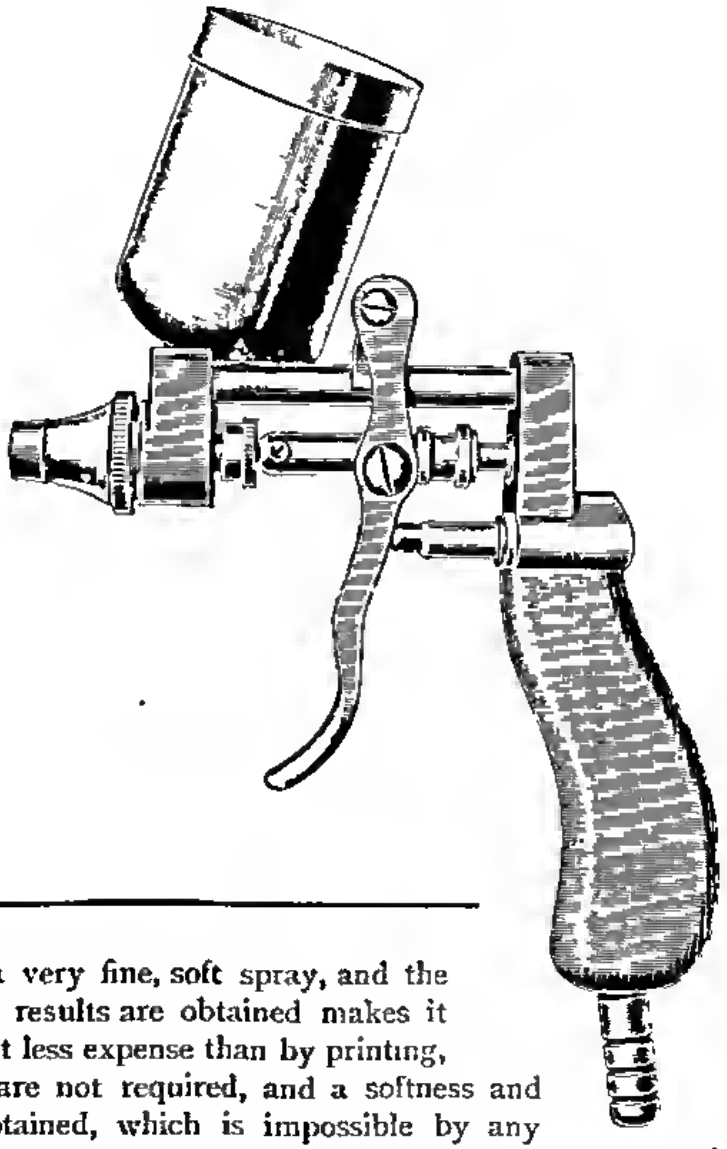
By J. E REESON.

MUCH has been written for the benefit of the process photographer. Much remains to be written. This being the age of cut prices the class of work suffers accordingly. But it is not always that the necessary haste is at the bottom of bad workmanship. The man himself is often to blame. The operator of to-day is not the clever, experienced man we met a few years ago, versed in the chemistry of photography. I am speaking of the majority. It is true we have many excellent men left, though they are sadly in the minority. With the facilities now offered it is easy to make negatives, hence the large percentage of boys

"Aerograph" Spray.

Pistol Pattern

FOR COLOURING
SHOW CARDS,
EMBOSSED CARDS,
AND ALL KINDS OF
STENCIL AND
SHADING WORK
ON ANY MATERIAL.



Other Sprays for Process and Litho Artists.

THIS Instrument gives a very fine, soft spray, and the rapidity with which the results are obtained makes it possible to produce the work at less expense than by printing, where very large quantities are not required, and a softness and exquisite texture may be obtained, which is impossible by any known process of printing.

Owing to the beautiful results obtained with the "Aerograph" certain classes of work have been revolutionized, and it is of the first importance to every printer that he should be prepared to meet the increasing demand for this new class of decorations.

Full Particulars of

The Aerograph Co., Ltd.,

Contractors to H. M. Government. 43, Holborn Viaduct, LONDON, E.C.